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No.

In The

Supreme Court of the United States

October Term, 1992

JENNMAR CORPORATION,
Petitioner,

v.

PATTIN MANUFACTURING COMPANY,
and
BIRMINGHAM BOLT COMPANY,
Respondents.

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR A WRIT OF CERTIORARI

Benjamin R. Civiletti*
George F. Pappas
Venable, Baetjer, Howard
& Civiletti
1201 New York Ave., N.W.
Suite 1200
Washington, D.C. 20005
(202) 962-4800

*Counsel of Record**
For Petitioner

Of Counsel:
Paul E. Krieger
Eugene R. Montalvo
Pravel, Hewitt, Kimball
& Krieger
1177 West Loop South
Houston, Texas 77027-9095
(713) 850-0909

Steven Kreiss
1401 New York Ave., N.W.
Washington, D.C. 20005
(202) 347-2400

Date: April 22, 1993

QUESTION PRESENTED

Whether summary reversal of a per curiam decision of a Federal Circuit Court of Appeals panel is appropriate where a patent process or method claim was construed to impliedly contain a structural limitation (a) in direct conflict with an unbroken line of authority of this Court's and other Federal Circuit panel decisions and (b) in denigration of the Constitutional objective and Congressional policy behind 35 U.S.C. §§ 271(g) and 295 to expand U.S. process patent rights to prevent the loss of American jobs and enhance American competitiveness in national and global markets.

STATEMENT PURSUANT TO RULE 29.1

All parties to the proceeding below are set forth in the caption to the case. Pursuant to Rule 29.1 of the Rules of this Court, petitioner, Jennmar Corporation, states that it is a wholly owned subsidiary of Frank Calandra, Inc., a privately held corporation, and has no subsidiary companies.

TABLE OF CONTENTS

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT 1

OPINION BELOW 1

JURISDICTION 1

CONSTITUTIONAL PROVISIONS AND STATUTES INVOLVED 1

STATEMENT OF THE CASE 1

A. Jennmar's Inventions 3

B. Prosecution of Jennmar 805 and 930 Patents 4

C. The Infringing Double Lock ("DL") Bolt 4

D. The 292 Apparatus and 885 Method Patents 5

E. Reexamination of the 292 and 885 Patents 8

F. The Decisions by the District Court and Federal Circuit 8

REASONS FOR GRANTING THE PETITION 11

A. The Lower Court Decision Is In Direct Conflict With Supreme Court and Federal Circuit Precedent And Is In Utter Disregard Of The Constitutional Objective . . 11

1. The Lower Court's Implication of a Structural Limitation into a Process Claim Conflicts With Supreme Court Precedent . 11

2. The Federal Circuit Panel Decision Is In Direct Conflict With Other Federal Circuit Panel Decisions 17

3. The Lower Court Decision Disregards The Objective Behind Article I, Section 8, Clause 8 of The Constitution 20

B. The Lower Court's Construction of Jennmar's Four Patents As One Patent is Inconsistent With The Patent Laws Doctrine of Claim Differentiation and 35 U.S.C. Sections 101 and 112 22

C. Congress's Recent Extraterritorial Extension of Process Protection Militates In Favor Of Granting This Petition 25

CONCLUSION 29

APPENDIX A - Federal Circuit Opinion Dated December 14, 1992 . . . . . A1

APPENDIX B - District Court Opinion Dated March 8, 1991 . . . . . A3

APPENDIX C - Federal Circuit Denial of Rehearing Petition Dated January 22, 1993 . . . . . A49

APPENDIX D - Relevant Constitutional and Statutory Provisions A51

APPENDIX E - 805 Method Claim 1 and 930 Apparatus Claim 15 . . . . . A53

APPENDIX F - 292 Apparatus Claim 1 . . . . . A55

APPENDIX G - Chart of Filing History for Jennmar Patents A57

SUPPLEMENTAL APPENDIX, U.S. Patent No. 4,516,885 . . . . . A58

TABLE OF AUTHORITIES

CASES

Amstar Corp. v. Envirotech Corp., 730 F.2d 1476 (Fed. Cir.), cert. denied, 469 U.S. 924 (1984) 17, 18

Atlantic Thermoplastics Co. Inc. v. Faytex Corp., 970 F.2d 834 (Fed. Cir.), reh'g denied, 974 F.2d 1279 (Fed. Cir. 1992) 19, 20

Cochrane v. Deener, 94 U.S. 780 (1877) 12, 13, 16-18

D.M.I., Inc. v. Deere & Co., 755 F.2d 1570 (Fed. Cir. 1985)23

Dennison Mfg. Co. v. Ben Clements & Sons, Inc., 467 F. Supp. 391 (S.D.N.Y. 1979) 14

In re Sarkar, 588 F.2d 1330 (C.C.P.A. 1978) 20

In re Tarczy-Hornoch, 397 F.2d 856 (C.C.P.A. 1968) . 21, 22

International Glass Co. v. United States, 408 F.2d 395 (Ct. Cl. 1969) 14, 18

Jennmar Corp. v. Pattin Mfg. Co., 12 U.S.P.Q.2d 1321 (S.D. Ohio 1989) 8

Jennmar Corp. v. Pattin Mfg. Co., 20 U.S.P.Q.2d 1721 (S.D. Ohio 1991) 1

Kingsdown Medical Consultants v. Hollister, Inc., 863 F.2d 867 (Fed. Cir. 1988), cert. denied, 490 U.S. 1067 (1989) 5, 25

Kistler Instruments A.G. v. United States, 628 F.2d 1303 (Ct. Cl. 1980) 24

Polaroid Corp. v. Eastman Kodak Co., 789 F.2d 1556 (Fed. Cir.), cert. denied, 479 U.S. 850 (1986) 18

Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F.2d 1565 (Fed. Cir. 1991) 18, 19

Specialty Composites v. Cabot Corp., 845 F.2d 981 (Fed. Cir. 1988) 25

Stewart-Warner Corp. v. City of Pontiac, Michigan, 767 F.2d 1563 (Fed. Cir. 1985) 24

Telephone Cases, 126 U.S.1 (1888) 21

Tilghman v. Proctor, 102 U S. 707 (1881) . . 2, 12, 13, 16-18

Waxham v. Smith, 294 U.S. 20 (1935) 13, 14, 17, 18

CONSTITUTIONAL PROVISIONS

United States Constitution, Article 1, Section 8, Clause 8 . . . . . 1, 11, 27

STATUTES

28 U.S.C. § 1254(1) 1

28 U.S.C. § 1295 17

35 U.S.C. § 100(b) 1, 14

35 U.S.C. § 101 . . . . . 1, 14, 23

STATUTES (cont'd)

35 U.S.C. § 103 20

35 U.S.C. § 112 . . . . . 1, 23, 25

35 U.S.C. §271(g) 1, 26

35 U.S.C. § 295 . . . . . 1, 27

REGULATIONS

37 C.F.R. § 1.142 4

MISCELLANEOUS

H.R. 100-60, 100th Cong., 1st Sess. (1987) 25-29

Manual of Patent Examining Procedure § 802.1, (5th ed. 1983) 4

Manual of Patent Examining Procedure § 806.05(e), (5th ed. 1983) 4

Manual of Patent Examining Procedure § 201.06, (5th ed. 1983) 4

Harmon, Patents and the Federal Circuit, § 5.6 (2d ed. 1988) 15, 23, 24

I Rosenberg, Patent Law Fundamentals, § 6.01[1] (2d ed. 1992 Rev.) 15

I Chisum, Patents, § 1.03[8] n.6.1 (1993) 16

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Petitioner Jennmar Corporation ("Jennmar") respectfully petitions for a writ of certiorari to review the decision of the United States Court of Appeals for the Federal Circuit, entered in the above-entitled proceeding on December 14, 1992.

OPINION BELOW

The per curiam opinion of the Court of Appeals for the Federal Circuit is unpublished and reproduced in Appendix ("App.") A, p. A1. The opinion and order of the district court, entered March 8, 1991, is reported at 20 U.S.P.Q.2d 1721 (S.D. Ohio 1991) and reproduced in App. B, pp. A3 - A48.

JURISDICTION

The judgment of the Court of Appeals for the Federal Circuit was entered on January 29, 1993. The petition for rehearing was denied on January 22, 1993. See App. C, p. A49. This Court has jurisdiction to review the judgment of the Court of Appeals for the Federal Circuit pursuant to 28 U.S.C. § 1254(1).

CONSTITUTIONAL PROVISIONS AND STATUTES INVOLVED

There no are constitutional and statutory provisions involved. Article 1, Section 8, clause 8 of the Constitution and the relevant portions of 35 U.S.C. §§ 100(b), 101, 112, ¶6, 271(g) and 295, cited below, are set forth in App. D, pp. A51 - A52.

STATEMENT OF THE CASE

In the Academy Award winning movie classic "How Green Was My Valley," a father, killed in a mine cave-in, was cradled

in the arms of his distraught son as they ascended from the deadly mine shaft. This petition relates to a patented process or method invention of installing coal mine roof bolts – mechanical devices that reinforce rock strata above underground mine passageways–to reduce or eliminate the deadly hazard of mine roof falls such as the one in the noted movie classic. This process invention saves lives.

This petition also relates to a well-entrenched and still essential distinction in this Court's patent law jurisprudence: that process or method patents, on one hand, and apparatus patents, on the other hand, cover different classes of invention and must be treated differently. Process or method patents may be infringed irrespective of the machine used to perform it; apparatus patents are construed in light of the components of the machine. As this Court recognized in Tilghman v. Proctor, 102 U.S. 707 (1881), implying structure into a process or method claim is legally incorrect, unfair to the patentee and unduly restricts patents for processes. And as Congress recognized in recently expanding process protection extraterritorially, this enhanced protection is an impressive first step in improving American competitiveness and reducing the trade deficit. In short, process patent protection saves American jobs.

Despite the importance of the apparatus/process distinction and petitioner's process invention, the district court below denied protection to petitioner's invention by refusing to distinguish between apparatus and process claims. In appealing this decision to the Federal Circuit, petitioner stressed the conflict between the district court's decision and Supreme Court precedent, and the Constitution itself. The Federal Circuit ignored these arguments and issued a summary affirmance. A motion for rehearing similarly failed to produce the mandatory reconciliation. The obviousness of this conflict and the absence of a written Federal Circuit opinion suggest summary reversal instead of plenary review of this petition. This action would save petitioner's invention and preserve an essential concept in this Court's patent law jurisprudence.

A. Jennmar's Inventions

After personally witnessing the failure of prior art mine roof bolts to adequately hold mine rock strata together, Frank Calandra, Jennmar's founder, discovered a process and apparatus for using a mechanical expansion shell with a curable resin to more effectively and safely support mine roofs. Soon thereafter, in 1980, he filed the first of four applications for patent on his discovery. Jennmar's inventions are described and illustrated in the 4,516,885 patent in the Supplemental Appendix.

Referring to the drawings in the 885 patent (Supp. App., pp. 2-3), the Calandra bolt contains bolt threads 18 which engage an expansion shell 28 and camming plug 52. The expansion shell 28 containing fingers 32 is mounted on the bolt threads 18 and held on the bolt with a jam nut (not shown). A threaded inner opening 54 of the camming plug 52 also engages the bolt threads 18. Tapered outer surfaces 68 of the plug 52 engage inner surfaces 46 of the expansion shell 28 when the plug is nested in the shell. A shear pin 76 is mounted in the camming plug. After a resin cartridge 24 with unmixed components is placed in a bore hole 14 (Fig. 8), the bolt 12 is moved upwardly, rupturing the cartridge 24. When the bolt 12 is rotated (circular arrow in Fig. 9), the shell assembly 10 rotates with the bolt and mixes the resin because the shear pin 76 prevents the camming plug 52 from moving (downwardly) relative to the bolt 12. When the resin mixture 88 begins to harden, it exerts a dragging force on the rotating shell assembly 10. When the strength of the shear pin 76 is exceeded by the drag, the pin 76 fractures (Fig. 10), allowing the camming plug 52 to move downwardly on the bolt threads expanding the expansion fingers 32 (Fig. 11) into engagement with the bore hole wall to anchor the bolt 12. The bolt 12 is tensioned through additional rotation in the same direction.

B. Prosecution of Jennmar 805 and 930 Patents

When Mr. Calandra filed his first application for patent in 1980, the PTO issued a restriction requirement, forcing Jennmar to elect whether to prosecute its method or apparatus (not both) claims in the initial application (the parent case, issued as U.S. patent 4,419,805), which sometimes happens when both apparatus and method claims are presented in one application,. See Manual of Patent Examining Procedure §§ 802.1, 806.05(e) (5th ed. 1983) ("MPEP"). The PTO examiner, thus, officially determined that the 805 parent application contained method claims to inventions independent and distinct from the apparatus claims originally contained in the 805 parent case. 37 C.F.R. § 1.142; MPEP § 201.06. Jennmar elected to pursue its method claims in the parent 805 case. Jennmar filed a separate application for an apparatus patent which issued as U.S. patent 4,413,930 patent. Importantly, both 805 method patent claims and the 930 apparatus claims expressly recite a critical structural limitation, i.e. "displacing the stop means," and "to displace said stop means" respectively, as underscored below.[1]

Prior to the issuance of the 805 patent, Mr. Calandra filed two further applications in accordance with well established patent practice to broaden the scope of his claims. These applications resulted in the issuance of the 885 method and U.S. patent 4,518,292 apparatus patents.

C. The Infringing Double Lock ("DL") Bolt

During the prosecution of the 292 and 885 patent applications, Jennmar learned of the infringing DL bolt manufactured by Pattin Manufacturing Company ("Pattin") and

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[1] The full texts of 805 claim 1 and 930 claim 15 are provided in App. E, pp. A53 - A54.

later its successor in interest Birmingham Bolt Company ("Birmingham"). As established by expert testimony and admitted by the designer of the DL bolt, respondents' DL bolt is essentially identical to the Jennmar bolt described above, except that it does not have a shear pin. While it employs the same type of resin cartridge, it uses a new, less viscous resin and competes directly in the marketplace with Jennmar's patented bolt. Although the DL bolt does not have a shear pin, its shell assembly still rotates to at least partially mix the resin while the camming plug is fixed relative to the shell. This occurs as a result of the frictional forces created when adjacent surfaces in the shell assembly and bolt threads rub against each other and cause a drag while the new resin is hardening. Thereafter, the bolt is rotated in the same direction as before to move the camming plug downwardly to expand the fingers of the shell and apply tension to the bolt.

D. The 292 Apparatus and 885 Method Patents

During prosecution of the 292 apparatus and 885 method claims before the PTO, Mr. Calandra intentionally broadened his claims to cover Pattin's DL bolt which had been illustrated in a sketch obtained by Jennmar from Pattin. This practice of drafting broader claims in a continuation application to cover a competitor's product of which the applicant becomes aware is entirely proper under the patent law. Kingsdown Medical Consultants v. Hollister, Inc., 863 F.2d 867, 874 (Fed. Cir. 1988), cert. denied, 490 U.S. 1067 (1989).

Shortly after Pattin provided this sketch to Jennmar, the latter cancelled its apparatus and method claims, which recited a displaceable "stop means," and added new apparatus and method claims which made no reference to a "stop means" or any "displacement" thereof. Jennmar also filed a petition to accelerate PTO examination of the 292 patent claims, stating that a lawsuit had been filed and that the DL bolt would "infringe at least some of the (new) claims of the instant application," without relying on a displaceable "stop means" or the like as the patentable feature.

The 292 patent claims, directed to the roof bolt apparatus, were then allowed. The full text of the 292 patent claim 1 is provided in Appendix F, pp. A55 - A56.

The 885 application was also filed to prosecute new process or method claims which would make no reference to a displaceable "stop means." A petition to accelerate examination was also filed (and later granted) requesting expedited treatment of the 885 claims in view of, inter alia, Pattin's manufacture of the accused DL bolt. The claimed subject matter was distinguished over the prior art on grounds unrelated to a displaceable "stop means" or the like. The claims were then allowed.

Representative claim 1 of the 885 method patent at issue is reproduced below:

> A method of anchoring a bolt in a bore hole comprising the steps of,
>
> positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,
>
> positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end of said threaded portion of said bolt in a manner that said camming plug is movable longitudinally on said bolt threaded portion,
>
> inserting a bonding material into a bolt [sic] hole,

> inserting said bolt with said camming plug threadedly engaged thereto into a bore hole,
>
> rotating said bore [sic] in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and
>
> thereafter rotating said bolt in said same preselected direction and moving said camming plug on said bolt to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole. (emphasis added).

The underscored 885 steps are the only ones at issue between the parties so far as infringement is concerned. The structure shown in the 885 patent (but not recited in the claims) for maintaining the camming plug in fixed relation with the expansion shell to mix at least a portion of the bonding material is the shear pin 76. When the shear pin fractures, the bolt rotates in the same direction as before to move the camming plug (downwardly) to expand the fingers of the expansion shell and apply tension to the bolt to anchor it in the bore hole.

Importantly, none of the 885 method claims 1, 2 and 5 expressly recite a shear pin or any structure for performing either of the two underscored steps in question. In critical contrast to these 885 claims, method claim 1 of the 805 parent patent does recite a structural limitation in its steps for performing the same function as noted in the 885 claims. This structural limitation is called a "stop means" in the 805 claims and corresponds to the shear pin 76 noted above. Claim 1 of the 805 parent method patent contains the step of "displacing" a "stop means." The 885 claims do not contain "displacing" terminology.

The relationship of the Jennmar patents is shown in a block diagram provided in Appendix G, p. A57.

E. Reexamination of the 292 and 885 Patents

After its purchase of Pattin, respondent Birmingham filed virtually identical reexamination petitions asserting that the 292 and 885 patent claims contained unpatentable subject matter over the prior art. Birmingham argued that the claims of the 292 patent were "generic" to the "more limited" claims contained in the 930 patent. Birmingham complained that the 292 and 885 claims were intentionally drafted by Jennmar to broaden the 930 patent claims to cover the accused DL bolt:

> ...the claims first presented in April, 1984 could, and are obviously intended to, cover not only bolt assemblies having the "stop means" of the previously issued patents, but also any structure having "means for mixing...while maintaining said expansion fingers in an unexpanded condition" (claim 1) or "means for mixing...while maintaining said camming plug fixed relative to said expansion shell" (claims 4 and 6). (Joint App. to Fed. Cir. Appeal A1467) Emphasis added.

Birmingham argued in the reexaminations that the claims should have the same broad construction Jennmar is urging in this litigation. After considering the broad claim construction advanced by Birmingham (and Jennmar in this litigation) and the same prior art placed before the district court and Federal Circuit below, the PTO confirmed the patentability of the subject matter of the 292 and 885 claims without any substantive change.

F. The Decisions by the District Court and Federal Circuit

A series of summary judgment motions dealing with the issue of infringement were filed by Pattin and/or Birmingham in the district court. On May 1, 1989, the district court found that the 805 and 930 patents had not been infringed. See, 12 U.S.P.Q.2d 1321. Pattin (supported by Birmingham) filed two

additional motions for summary judgment of non-infringement for the 885 and 292 patents. These were granted on March 8, 1991.

In its March 8, 1991 order, the district court implied into all claims of the 885 method patent the structural limitation of "some tangible displaceable device":

> Based on a thorough examination of the claim language, specification and prosecution history, the Court concludes that the 885 patent clearly contemplates some tangible, displaceable device which assures that the camming plug and expansion shell are maintained in fixed relation to each other during the mixing process and which is thereafter released or overcome to permit completion of the anchoring of the bolt. ... Although Claims 1, 2, and 5 may not require a specific shear pin, by their own terms, they contemplate a tangible, displaceable device capable of assuring that the camming plug and the expansion shell remain in a fixed relation to each other during the mixing process. (emphasis added). App. B, pp. A37.

The district court reached precisely the same conclusion with respect to the apparatus claims of the 292 patent.[2] In other

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[2] The district court concluded:

> ... that claims 1, 4 and 6 [of the 292 patent] clearly contemplate some tangible physical device which reliably maintains the shell unexpanded or fixes the camming plug in position during the mixing stage and which is thereafter displaced or overcome at a predetermined point to permit

words, the district court failed to construe the 885 method claims differently than the 292 apparatus claims. Furthermore, the district court acknowledged that its construction of these 885 and 292 claims was the same as that set forth in its May 1, 1989 order with respect to the infringement of the 805 and 930 patents.[3] In brief, the district court refused to draw any distinction between (a) the 292 apparatus and 885 method claims in issue, and (b) the 805 method claims, which recited a structural limitation--displaceable "stop means"--and the 885 method claims which did not. Having thus departed from established precedents, the district court went

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> movement of the camming plug to effect expansion of the shell, Plaintiff's claims contemplate a means which assures the intentional rotation of the shell during the mixing phase of installation. (emphasis added). App. B, pp. A26-A27.

[3] In its May 1, 1989 order, the district court construed the "stop means" recited in the 805 method claims as covering "some tangible device" which is "displac[ed]" "to permit the camming plug to rotate on the bolt to expand the expansion shell and anchor the bolt." The 930 patent was also construed in like manner:

> In the Court's view, the 930 patent clearly contemplates some tangible physical device inserted within the camming plug itself which initially prevents movement of the camming plug downward on the bolt, which device is then displaced in some manner when a torque in excess of that predetermined is applied to the bolt. The "stop means" in the 930 patent is a physical object or device capable of being displaced, which prevents expansion of the expansion shell until a preselected point is reached in the installation process. (emphasis added).

on to hold that the DL bolt did not infringe Jennmar's 885 patent because the DL bolt had no "tangible, displaceable device."

Jennmar appealed this March 8 decision to the Federal Circuit. In its appeal, Jennmar made the arguments contained in this petition that the district court's decision conflicted with established Supreme Court precedents, decisions of other Federal Circuit panels and the objective behind Article 1, Section 8, Clause 8 of the Constitution.

Rather than attempt the impossible reconciliation of the district court's opinion with these controlling authorities, the Federal Circuit abdicated its responsibility by affirming per curiam the district court decision. Jennmar then requested a rehearing to have the Federal Circuit explain its departure from the controlling precedents. Once again, the Federal Circuit refused to explain its decision.

REASONS FOR GRANTING THE PETITION

A. The Lower Court Decision Is In Direct Conflict With Supreme Court and Federal Circuit Precedent And Is In Utter Disregard Of The Constitutional Objective

1. The Lower Court's Implication of a Structural Limitation into a Process Claim Conflicts With Supreme Court Precedent

The petition should be granted because the Federal Circuit abdicated its responsibility by affirming per curiam a district court decision that is directly in conflict with this Court's precedent applying the legal principle that a structural limitation, even one found in a patent specification, may not be implied into a process or method claim. This legal principle has remained viable and well-entrenched in our jurisprudence for over one hundred years.

The first Supreme Court case dealing with this legal principle was Cochrane v. Deener, 94 U.S. 780 (1877), where Cochrane's patent for an improved process for manufacturing flour was at issue. In his patent specification, Cochrane disclosed bolting reels clothed with progressively fine meshes to manufacture the flour. The defendants used different machinery to perform the same process," a flat sieve or screen in place of reels." Id. at 787-88. This Court held that the patented process was infringed irrespective of the machinery used to perform the process:

> That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar or a mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same. A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. (emphasis added) Id. at 787-88

The stated rationale was that the patent was for a process, not the apparatus used in performing that process. For this reason, implying structure into a process claim, which is not intended to cover the disclosed apparatus, is legally incorrect, unfair to the patentee and unduly restricts patents for processes.

In 1880, immediately following Cochrane, this Court decided Tilghman v. Proctor, 102 U.S. 707 (1880), which

involved a patent for the process of treating fats and oils and separating them into fat acids and glycerine by action of water at a high temperature and pressure. Tilghman's patent claim specified "[t]he manufacturing of fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure." Although his specification disclosed a heated coil of pipe standing in a furnace as one of several ways in which the process could be employed, this Court refused to restrict his claim to that apparatus:

> ...how can we, by any fair rule of construction, circumscribe this claim in such a manner as that it shall only cover the process when applied in the case of a coil of pipe heated to 612° Fahrenheit? Or, if we allow it to embrace any "convenient vessel," and do not confine it to a coil of pipe, how can we confine it to a particular degree of heat? 102 U.S. at 721.

After recognizing the Constitutional basis for process or method patents as "clearly an art, within the meaning of the law," Justice Bradley, speaking for this Court, held that where "the apparatus for performing the process was not patented [expressly recited in the claim], [it] was not material." A patentee is simply not confined to the apparatus described in his process patent unless said apparatus is expressly recited in the claim. Id. at 722, 730. See also Cochrane, 94 U.S. at 787-88. As a result, this Court found that "patentee [Tilghman] is not confined to a metallic coil of pipe heated in a furnace; [instead,] his patent extends to and embraces any convenient vessel [such as defendants'] for holding the mixture." 102 U.S. at 730.

Approximately fifty years later, this Court revisited the legal principle in Cochrane and Tilghman. In Waxham v. Smith, 294 U.S. 20 (1935), a case involving a method for incubating eggs, this Court stated that a method "may be patented irrespective of the particular form of the mechanism which may be availed of

for carrying it into operation" (emphasis added). This Court held that:

> Petitioner does not avoid infringement of respondent's method patent merely by employing it in a machine of different structure than respondent's, whether more or less efficiently. (emphasis added). Id. at 23.

The common thread between these cases is that process and apparatus patents cover different classes of invention and must be treated differently. The former may be infringed irrespective of the machine used in performing it. The latter is construed in light of the components of the machine. For this reason, a process is covered by a claim defining a series of steps or acts while the apparatus employed to perform it is covered by an apparatus claim.

This principle was followed in Dennison Mfg. Co. v. Ben Clements & Sons, Inc., 467 F. Supp. 391, 405 (S.D.N.Y. 1979), where the court stated that "a process or method is patentable in and of itself, 35 U.S.C. §§ 100(b) and 101, there being no requirement that structure be disclosed in a method claim." In International Glass Co. v. United States, 408 F.2d 395, (Ct. Cl. 1969) (adopting 159 U.S.P.Q. 434) the Court of Claims followed Tilghman, and clearly articulated the law of infringement with respect to process claims:

> A patented process is infringed only by unauthorized performance of substantially the same process steps in substantially the same way to accomplish substantially the same result. It is not necessary that the accused process be practiced with the same or substantially the same apparatus as disclosed by the patentee. (emphasis added). 408 F.2d at 400.

Based on these cases, it is apparent that the basic legal principle involved in this case has withstood the test of time and remains binding precedent.

Legal scholars have reiterated this longstanding legal principle applicable to process claims. See Harmon, Patents and the Federal Circuit, § 5.6 (2d ed. 1988):

> The claims defining some inventions can by competent draftsmanship be directed to either a method or an apparatus. There is nothing improper in this state of affairs, and the exercise of the inventor's option on how to claim his invention is to be respected in interpreting the claims. But once they issue in a particular form, the protected invention is, as a matter of law, that form. Thus, a method claim protects a method and is not to be interpreted as directed to equipment, even equipment for performing the claimed method. Apparatus distinctions are said to be irrelevant in determining infringement of process claims. Yet a structural recitation in a method claim step can be construed as a limitation on the claim. (footnotes omitted, emphasis added).

I Rosenberg, Patent Law Fundamentals, § 6.01[1] (2d ed. 1992 Rev.)

> Regarding the relationship between a method and the apparatus used in carrying it out, the rule, at least in determining infringement, is that a method patent is not dependent on the form of the apparatus used.

* * *

> Stated in other words: the patentability of a process claim must turn upon process limitations; the patentability of machine claims must turn upon machine limitations. (emphasis added).

* * *

I Chisum, Patents, § 1.03[8] n. 6.1 (1993):

> It follows that a process patent claim may cover and be infringed by the unauthorized carrying out of the process on different, even significantly improved apparatus.

Accordingly, the legal principle which prevents structure from being impliedly read into a process claim is stronger today, having weathered the test of time, than it was over one hundred years ago when Cochrane and Tilghman were decided. It is abundantly clear that the district court and Federal Circuit ignored this principle when they construed the 885 method claims as requiring "a tangible displaceable device." These claims can not, under the above authority of this Court, be construed to contain "a tangible displaceable device" limitation when such a device is not expressly recited in them.

While the 885 method patent describes a shear pin or length of bendable wire as the preferred structure for performing the recited act of "maintaining said camming plug in fixed relation with said expansion shell to thereby mix...," the shear pin, or as the district court called it "a tangible displaceable device," is irrelevant to whether respondents' DL bolt performs the claimed process. The district court and Federal Circuit should have focused on the acts performed in the claimed process and compared them with the acts performed by the accused DL bolt. Focus should not have been placed on the structure in the 885 patent for performing these acts.

The district court did exactly what was proscribed in Cochrane, Tilghman, and Waxham. It focused on structure in analyzing a process claim. In affirming the district court per curiam, the Federal Circuit abdicated its responsibility to reverse. This Court should reverse to rechart the correct course in determining infringement under the patent law in regard to process claims.

2. The Federal Circuit Panel Decision Is In Direct Conflict With Other Federal Circuit Panel Decisions

Not only is the district court decision below and Federal Circuit per curiam adoption thereof in direct contravention of Supreme Court precedent, they are also in direct conflict with earlier Federal Circuit panel decisions. This conflict between Federal Circuit panel decisions is analogous to a conflict between regional circuit court decisions because the Federal Circuit now has exclusive jurisdiction over patent matters under 28 U.S.C. § 1295 (1982). Conflictual circuit court decisions in patent matters, therefore, may only occur between Federal Circuit panel decisions.

Here, a Federal Circuit panel permitted the structural limitation of a "tangible displaceable device" to be implied into steps in the 885 process claims, which do not expressly recite that limitation. This decision is contrary to the decision of another Federal Circuit panel which refused to imply any apparatus limitation into a process claim when determining infringement. In Amstar Corp. v. Envirotech Corp., 730 F.2d 1476, (Fed. Cir.), cert. denied, 469 U.S. 924 (1984), the patented process used specially designed nozzles to inject flocculent solution into a flared outlet feed pipe to promote flocculation. The accused Envirotech process used sophisticated mechanical (impeller) mixing to promote flocculation. The Amstar panel held that an accused product "could not be found non-infringing because it lacked a flared outlet feed pipe" since that structural limitation was not expressly

contained in asserted process claims 1 and 8, but was "present [recited] in non-asserted claim 11." 730 F.2d at 1482. In so holding, that Federal Circuit panel correctly articulated the controlling legal principle:

> [T]he law recognizes the irrelevance of apparatus distinctions in determining infringement of process claims. International Glass Co. v. United States, 408 F.2d 395, 400, 161 U.S.P.Q. 116 (Ct.Cl. 1969). (bracketed material added). Id.

As mentioned above (p. 15), International Glass had cited this Court's decision in Tilghman as authority for the articulated legal principle. Accordingly, the Federal Circuit correctly adopted the legal principle set forth by this Court in Cochrane, Tilghman and Waxham prior to the Federal Circuit's review of this case.

Subsequent to Amstar, the Federal Circuit had another occasion to apply the Tilghman v. Proctor rule to process claims. In Polaroid Corp. v. Eastman Kodak Co., 789 F.2d 1556 (Fed. Cir.), cert. denied, 479 U.S. 850 (1986), Kodak argued that its "PR-10 film unit contains a layer of fluid processing composition between the cover sheet element (which contains the acid), and the IIR (the photosensitive element)." This Federal Circuit panel quickly disposed of this Kodak argument by holding that "as the district court correctly noted, apparatus distinctions not claimed are not controlling in determining infringement of process claims." [citing Amstar]. 789 F.2d at 1562.

The Federal Circuit's decision in the case at bar regarding the proper construction of process claims is not the only legal principle regarding process patents on which Federal Circuit panels have reached contrary results. In Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F.2d 1565 (Fed. Cir. 1991), one Federal Circuit panel ruled that process limitations in a product-by-process claim are not to be construed as claim

limitations. This ruling means that if a patented product is defined in a patent claim as being prepared by a defined process, the same product prepared by a wholly different process still will infringe that product-by-process claim:

> [T]he correct reading of product-by-process claims is that they are not limited to [a] product prepared by the process set forth in the claims. (bracketed material added). Id. at 1583.

In Atlantic Thermoplastics Co. Inc. v. Faytex Corp., 970 F.2d 834 (Fed. Cir.), reh'g denied, 974 F.2d 1279 (Fed. Cir. 1992) a different Federal Circuit panel expressly declined to follow Scripps because the Scripps panel failed "to consider Supreme Court precedent..." 970 F.2d at 839. Instead the Atlantic panel held:

> "process terms in product-by-process claims serve as limitations in determining infringement." Id. at 846-47.

In Atlantic, a petition for rehearing was denied. In his dissent from that denial, Judge Rich noted:

> The [Atlantic] panel has misapprehended its function as an arm of this court. It has violated a rule of this court which has existed since its creation. It has misconstrued the early Supreme Court opinions on which it relies to justify violation of the rule.
>
> * * *
>
> This is not only insulting to the Scripps panel ... it is mutiny. It is heresy. It is illegal. (emphasis

added). 974 F.2d at 1279, 1281 (Fed. Cir. 1992).

As Judge Rich further observed "... the conflict [in panel decisions] should have been eliminated in banc to avoid confusion in the law." (bracketed material added). 974 F.2d at 1281. See also, Judge Rader's response to Judge Rich's dissent. 974 F.2d at 1299 (Fed. Cir. 1992).

Here, the longstanding and well-settled legal principle against reading a structural limitation into a process claim had a rock-solid foundation in the patent law for over one hundred years, much like the product-by-process rule of law. The Federal Circuit's refusal to reverse a district court decision which violated this well-settled principle now places this rule on a quicksand foundation creating confusion in the law as Judge Rich observed with respect to product-by-process claims. This Court can correct the "mutiny", "heresy" and illegality associated with different panel decisions and eliminate this confusion in the patent law relating to the reading of structural limitations into process claims which, in this day and age, have become so especially important to the viability of our economy as will be demonstrated below.

3. The Lower Court Decision Disregards The Objective Behind Article I, Section 8, Clause 8 of The Constitution

Chief Judge Markey of the Court of Customs and Patent Appeals said in In re Sarkar, 588 F.2d 1330, 1333, 137 (C.C.P.A. 1978):

> [T]he patent system encourages disclosure of technological breakthroughs. It deals largely with disclosure of the unforeseen, the obviously foreseeable being rejected, 35 U.S.C. § 103. Hence, to limit "any process" to familiar or

> predicted arts would be to stifle much technology at its birth. (footnote omitted, emphasis added).

Stifling technology at its birth or at any time is the antithesis of the Constitutional objective of promoting the progress of the useful arts and sciences. Yet, that is precisely what would occur if a claimed process were limited by unrecited structure disclosed in a patent specification. This follows because a patentee would not be able to extend his process patent to apparatus for performing his process which later becomes commercially important or of which he is unaware when inventing the process. The patentee's incentive to disclose his invention to the public would surely be stifled if he knew that in a field of fast changing technology, his patent would not be construed to cover newly designed apparatus.

This Court in the Telephone Cases, 126 U.S.1 (1888) refused to sanction such a result. Alexander Graham Bell obtained a patent with apparatus and method claims. His method claim recited a "method of ... transmitting vocal... sounds telegraphically...by causing electrical undulations, ..." Id. Bell's patent disclosed apparatus for creating undulations through electro-magnetism. Bell failed to claim a variable resistance apparatus for creating undulations, the latter being later adopted as the commercial mode of telephonic communication. This Court sustained Bell's method claim and construed it to cover the variable resistance equipment which performed the claimed process. As was noted by Judge Rich in In re Tarczy-Hornoch, 397 F.2d 856, 868 (C.C.P.A. 1968):

> In the Telephone Cases, supra, it was pointed out that Bell's invention, primarily a method, would have been lost to him had his process claim been held invalid since he had failed to claim apparatus which later became commercially important. But the Court upheld the method claim: "Surely a patent for such a discovery is not to be confined to

> the mere means he improvised to prove the reality of his conception." We think it clear that justice militates against so confining any process patent. (emphasis added).

Based on this analysis, Judge Rich ruled in Tarczy-Hornoch that a method claim was patentable, regardless of whether the inventor disclosed one, two or more machines to carry them out. The inventor was entitled to cover all machines with one method claim under the following reasoning.

> The essential difficulty is in the fact that, although at the time of the application only one apparatus may be known which is capable of carrying out the process, others may become available later. In which case, of course, the inventor may be cheated of his invention. It is peculiarly our responsibility to see that the decisional law does not require this kind of inequity. (emphasis added). Id. at 868.

The same equitable result should be reached here. Merely because the DL bolt, which does not contain a shear pin, employed a new resin, which permitted respondents to perform the claimed method, should not have negated infringement. Jennmar's 885 process claims do not recite, and are thereby not confined to, the structure for performing the steps in issue. Neither did Bell's method claim. Jennmar should not be cheated of its process invention, just as Bell was not. To do so thwarts the Constitutional objective.

B. The Lower Court's Construction of Jennmar's Four Patents As One Patent is Inconsistent With The Patent Law Doctrine of Claim Differentiation and 35 U.S.C. Sections 101 and 112

The district court's May 1, 1989 and March 8, 1991 orders construed all four Jennmar patents as one, each apparatus and

method claim covering "a tangible displaceable device." By affirming per curiam the district court's decision, the Federal Circuit ignored the doctrine of claim differentiation and 35 U.S.C. Sections 101 and 112.

The earlier 930 apparatus patent claims were construed by the district court as covering "some tangible physical device ... which is then displaced ..." The 930 patent claims expressly recite a "stop means" and rotation of the bolt "to displace said stop means". The 292 patent claims (1, 4 and 6) were likewise construed to cover "some tangible physical device... which is thereafter displaced..." The 292 claims originally recited a "stop means" which was displaced; subsequently, the claims were amended by deleting the "stop means" and its displacement when Jennmar obtained a sketch of the accused DL bolt. The amended 292 apparatus claims were couched in means plus function language without specifying a tangible displaceable device or stop means which is displaced.

By construing the 885 method claims just like the 930 and 292 apparatus claims, the district court indeed obliterated the distinction between these method and apparatus claims in denigration of 35 U.S.C. § 101 which sets forth four distinct statutory classes for patents, including processes and machines (apparatus). Merging these classes through claim construction is inconsistent with the Statute. See Harmon, Patents And The Federal Circuit, supra at § 5.6.

The district court's reading of a "tangible displaceable device" limitation into the 885 method claims also constitutes a clear violation of the "immutable and universally applicable" doctrine of claim differentiation, which forbids the reading of a limitation in one claim into another claim to avoid infringement. D.M.I., Inc. v. Deere & Co., 755 F.2d 1570, 1574, (Fed. Cir. 1985). The doctrine of claim differentiation is one of the most important rules in the patent law. As one legal scholar has observed:

> The Court (Federal Circuit) obviously feels strongly about this [claim differentiation] rule. It has been called a fixed rule that enjoys an immutable and universally applicable status comparatively rare among rules of law. Without it, the entire statutory and regulatory structure governing the drafting, submission, examination, allowance, and enforceability of claims would crumble. (footnote omitted)
>
> There is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims. (emphasis and bracketed material added). Harmon, Patents and the Federal Circuit, supra, § 5.6.

The district court should have presumed a difference between the 885 and 805 method claims because the displaceable stop means language still appearing in the 805 method claims, was intentionally deleted from the 885 method patent claims. It therefore could not properly be read back into them. Stewart-Warner Corp. v. City of Pontiac, Michigan, 767 F.2d 1563, 1571 (Fed. Cir. 1985) (it is error for a district court to read a limitation into a claim which was eliminated from that claim during prosecution); Kistler Instruments A.G. v. United States, 628 F.2d 1303, 1308 (Ct. Cl. 1980) (aff'g and adopting 202 U.S.P.Q. 511, 516) ("claims limitations...removed during prosecution" cannot be read back into the claims). Since the 805 method claims explicitly refer to the "displacing [of] the stop means," the district court should have construed the 885 method claims, as being broader than the "displacing [of] the stop means," i.e., "a tangible displaceable device," and as covering any bolt which acts to maintain the camming plug in fixed relation with the shell to mix the bonding material and thereafter, upon further rotation of the bolt, to move the camming plug to expand the shell fingers to anchor the bolt.

The fact that the limitations being compared appear in claims in related patents makes no difference since claims in related patents, such as the ones at bar, are properly compared under the doctrine of claim differentiation. Specialty Composites v. Cabot Corp., 845 F.2d 981, 987 (Fed. Cir. 1988); Kingsdown, 863 F.2d at 874-75 (claims in parent and continuation applications were compared).

Finally, the district court's merging of Jennmar's patents was also inconsistent with 35 U.S.C. § 112 ¶ 6, a section explaining the manner in which means plus function clauses in (process or apparatus) claims and steps for performing specified functions in a process claim are to be construed. According to Section 112, the claimed steps of a process need not recite structure, but "shall be construed to cover the corresponding...acts described in the specification and equivalents thereof." On the other hand, a means (apparatus) for performing a specified function, when expressly recited in a claim, shall be construed to cover the corresponding structure...in the specification and equivalents thereof." Since the district court failed to focus on the acts specified in the 885 process claims in issue, it failed to apply Section 112 correctly. For this reason, it should have been reversed by the Federal Circuit.

C. Congress's Recent Extraterritorial Extension of Process Protection Militates In Favor Of Granting This Petition

Rapid advances in the computer, pharmaceutical, and biotechnology industries have impressed upon both the Executive and Legislative Branches, the importance of strengthening process patent protection. Three presidential administrations called for increased process patent protection: first in 1966 by President Johnson's Commission on the Patent System; then in 1979 by President Carter's Domestic Policy Review on Industrial Innovation; and again in 1985 by President Reagan's Commission on Industrial Competitiveness. H.R. 100-60, 100th Cong., 1st Sess. (1987). By 1987, expanding process patent protection was

deemed by Congress to be of the utmost importance to our economy:

> Process patent protection today is of central importance in the pharmaceutical industry, to the development of solid state electronics, for the manufacture of certain amorphous metals and, perhaps most significantly, for the biotechnology industry. For most biotech companies the best--and sometimes only--available protection for their intellectual property is a process patent. (footnotes omitted) Id.

As a result, Congress passed the Process Patent Amendments Act of 1988 expanding process patent protection to processes practiced extraterritorially (not in the United States or its territories) which result in products imported into the United States. 35 U.S.C. § 271(g) (1988).

The findings of Congress in passing this 1988 Act explain why there is a critical need for our judiciary to construe process patents in accordance with the Supreme Court precedent discussed above, not restrictively as was done in the case at bar. The House report contains the following conclusions:

> The failure fully to protect American process patents harms American businesses and produces results contrary to the public interest. Virtually all of our major trading partners adequately protect process patents, thus leaving American patent holders in a position to become the victims of unfair competition.
>
> * * *
>
> The issue of expanded process patent protection is one in which Congress must face serious and

> legitimate questions about the United States balance of trade. Enactment of this legislation would be an impressive first step in furthering the protection of United States intellectual property rights, in reducing the trade deficit, and in improving American competitiveness in the world marketplace. (emphasis added). H.R. 100-60 100th Cong., 1st Sess. (1987).

As the House Report also noted:

> As a consequence, the unfettered ability of others to import, sell or use a product made by the patented process, severely diminishes the value of a U.S. process patent. It also results in the loss of American jobs, particularly in new technology areas. (emphasis added). H.R. 100-60, 100th Cong., 1st Sess. (1987).

In the case at bar the district court and Federal Circuit implied structure in a patent specification into a process claim, and thus ignored the reaffirmation of process protection that prompted enactment of the 1988 Process Patent Amendments Act. Under the lower court's approach, a foreign manufacturer wishing to circumvent the reach of the 1988 Act need only argue that its process is different from the one patented because different machinery is used. The foreign manufacturer can now argue that the U.S. process patent is restricted to some recharacterized structural feature disclosed in the specification for performing a recited claim step, just as respondents did here.

Because process patent protection is so important to our economy today, Congress fully appreciated the need to solve problems associated with enforcement of process patents under the 1988 Act. Under the 1988 Act, a rebuttable presumption was created that the patented process was used in a foreign country under certain circumstances. 35 U.S.C. § 295 (1988). The

presumption was necessary because patent owners face great difficulty in proving infringement of a process patent by a foreign manufacturer.[4]

The lower court decision here would also thwart the intent behind the statutory presumption. Instead of the foreign manufacturer establishing that the product was made by another method, the manufacturer will argue that the product was made by another, wholly different, machine. If that foreign manufacturer is successful, as were respondents below, the following harmful economic effects of inadequate process patent protection will result, as Congress found; a reduction in American competitiveness in the world market, balance of trade problems, and loss of American jobs due to the incentive to manufacture overseas.

The American public simply can not afford the "loss of American jobs," and reduced American competitiveness, particularly in times of recession and the concomitant and

---

[4] As was observed in the House Report:

> This presumption addresses a great difficulty a patentee may have in proving that the patented process was actually used in the manufacture of the product in question in those cases, where the manufacturer is not subject to discovery under the Federal Rules of Civil Procedure. For example, patent owners will frequently be unable to obtain information concerning the nature of processes being practiced by foreign manufacturers. Shifting the presumption should create no substantial burden, as an accused infringer should be in a much better position to establish that the product was made by another method. (emphasis added). H.R. 100-60, 100th Cong., 1st Sess. (1987).

increasing industry layoffs we face in today's marketplace. These adverse consequences are the direct and plain result of restrictive and erroneous process patent construction. In view of the importance of process patent protection to our economy, this Court should summarily reverse and return our course in construing process patents to the legal principle against implying structure into process claims which has flourished for over 100 years.

As was noted by Congress:

> America's leading position in technology innovation throughout the world is credited in large part to the stimulus of its patent system, which stems ultimately from Article I, Section 8, clause 8 of the Constitution... In the past two decades, however, it has become necessary to modernize our patent laws. As compared with those of our major trading partners, the inadequate protection contained in U.S. process patent law has emerged as a major factor in the dynamics of global innovation and economic competition. H.R. 100-60, 100th Cong., 1st Sess. (1987).

This Court is now in the position to correct a deviation in the patent law relating to process inventions – a correction that will have a major impact "in the dynamics of global innovation and economic competition."

CONCLUSION

The petition for a writ of certiorari should be granted on the ground that the decision below is of exceptional importance because it threatens to chill the fundamental purposes of the patent law to encourage the disclosure for inventions and thwart the Congressional purpose behind the Process Patent Amendments Act of 1988. As Congress has found, process patent protection – the key issue in the case at bar – relates to a strong American

economy and a reduction of the trade deficit. Because the decision below so clearly contravenes Supreme Court and other Federal Circuit panel decisions, plenary review may not be warranted. However, the importance of the issues involved at minimum call for summary reversal of the Federal Circuit's decision.

Respectfully submitted,

Benjamin R. Civiletti*
George F. Pappas
Venable, Baetjer, Howard
& Civiletti
1201 New York Ave., N.W.
Suite 1200
Washington, D.C. 20005

*Counsel of Record**
For Petitioner

Of Counsel:

Paul E. Krieger
Eugene R. Montalvo
Pravel, Hewitt, Kimball
& Krieger
1177 West Loop South
Tenth Floor
Houston, Texas 77027-9095

Steven Kreiss
1401 New York Ave., N.W.
Suite 740
Washington, D.C. 20005

Date: April 22, 1993

APPENDIX

APPENDIX A
Federal Circuit Opinion Dated December 14, 1992

Note: Pursuant to Fed. Cir. R. 47.8, this disposition is not citable as precedent. It is a public record. This disposition will appear in tables published periodically.

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT
92-1250, -1251, -1252

JENNMAR CORPORATION,

Plaintiff-Appellant,

V.

PATTIN MANUFACTURING COMPANY,

Defendant/Cross-Appellant,

and

BIRMINGHAM BOLT COMPANY,

Defendant/Cross-Appellant.

JUDGMENT

ON APPEAL from the UNITED STATES DISTRICT COURT SOUTHERN DISTRICT OF

A2

OHIO/COLUMBUS

in CASE NO(S). No. 2-84-878

This CAUSE having been considered, it is

ORDERED and ADJUDGED:

Per Curiam (NIES, Chief Judge, NEWMAN and RADER, Circuit Judges):

AFFIRMED. See Fed. Cir. R. 36.

ENTERED BY ORDER OF THE COURT

DATED DEC 14 1992

/s/ Francis X. Gindhart
Francis X. Gindhart, Clerk

ISSUED AS A MANDATE: January 29, 1993

APPENDIX B
District Court Opinion Dated March 8, 1991

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF OHIO
EASTERN DIVISION

JENNMAR CORPORATION,	:	
Plaintiff,	:	
vs.	:	Case C-2-84-878
PATTIN MANUFACTURING COMPANY, AN UNINCORPORATED DIVISION OF THE EASTERN COMPANY,	:	
Defendant,	:	
and	:	
BIRMINGHAM BOLT COMPANY,	:	
Intervenor.	:	

MEMORANDUM AND ORDER

This is a patent infringement action involving mine roof bolts which are used to support the root areas of mines in the way timber supports were once used. On May 1, 1989 this Court granted defendant's motions for partial summary judgment concerning plaintiff's patents numbered 4,413,930 ("930") and 4,419,805 ("805)"), holding that defendant's device does not infringe. Presently before this Court are defendant's third and fourth motions for partial summary judgment of non-infringement of plaintiff's patents numbered 4,518,292 ("292") and 4,516,885

("885"). The parties, including intervenor Birmingham Bolt, have filed extensive briefs in support of their respective positions and oral argument was held before this Court regarding the 292 and 885 patents on June 6, 1990.

Patent 292 in related to previously-considered patent 805 in that it is a division of 805; patent 885 is a continuation of patent 292. Although all these patents refer to the same specification, drawings, and abstract, plaintiff claims that its patents 292 and 885 are broader in scope than the patents previously considered by the Court and that therefore defendant's Double Lock bolt literally infringes on Claims 1, 4, and 6 of patent 292 and claims 1, 2 and 5 of patent 885.

I. STANDARDS FOR SUMMARY JUDGMENT

Fed. R. Civ. P. 56(c) provides:

> [Summary judgment]...shall be rendered forthwith if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of law.

"[T]his standard provides that the mere existence of some alleged factual dispute between the parties will not defeat an otherwise properly supported motion for summary judgment; the requirement is that there be no genuine issue of material fact." Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 247-48 (1986) (emphasis in original); Kendall v. Hoover Co., 751 F.2d 171, 174 (6th Cir. 1984).

Summary judgment will not lie if the dispute about a

material fact is genuine; "that is, if the evidence is such that a reasonable jury could return a verdict for the nonmoving party." Anderson, 477 U.S. at 248. The purpose of the procedure is not to resolve factual issues, but to determine if there are genuine issues of fact to be tried. Lashlee v. Sumner, 570 F.2d 107, 111 (6th Cir. 1978). Therefore, summary judgment will be granted "only where the moving party is entitled to judgment as a matter of law, where it is quite clear what the truth is .... [and where] no genuine issue remains for trial,...[for] the purpose of the rule is not to cut litigants off from their right of trial by jury if they really have issues to try." Poller v. Columbia Broadcasting Sys., 368 U.S. 464, 467 (1962) (quoting Sartor v. Arkansas Natural Gas Corp., 321 U.S. 620, 627 (1944)); accord County of Oakland v. City of Berkley, 742 F.2d 289, 297 (6th Cir. 1984).

In making this inquiry, the standard to be applied by the Court mirrors the standard for a directed verdict. Celotex Corp. v. Catrett, 477 U.S. 317, 323 (1986); Anderson, 477 U.S. at 250.

> "The primary difference between the two motions is procedural; summary judgment motions are usually made before trial and decided on documentary evidence, while directed verdict motions are made at trial and decided on the evidence that has been admitted." Bill Johnson's Restaurants, Inc. v. NLRB, 461 U.S. 731, 745, n.11 (1983). In essence, though, the inquiry under each is the same: whether the evidence presents a sufficient disagreement to require submission to a jury or whether it is so one-sided that one party must prevail as a matter of law.

Anderson, 477 U.S. at 251-52. Accordingly, although summary judgment should be cautiously invoked, it is an integral part of the Federal Rules, which are designed "to secure the just, speedy and inexpensive determination of every action." Celotex, 477 U.S. at

327 (quoting Fed. R. Civ. P. 1).

In a motion for summary judgment the moving party bears the "burden of showing the absence of a genuine issue as to any material fact, and for these purposes, the [evidence submitted] must be viewed in the light most favorable to the opposing party." Adickes v. S.H. Kress & Co., 398 U.S. 144, 157 (1970) (footnote omitted); accord Adams v. Union Carbide Corp., 737 F.2d 1453, 1455-56 (6th Cir.), cert. denied, 469 U.S. 1062 (1984). Inferences to be drawn from the underlying facts contained in such materials must also be considered in the light most favorable to the party opposing the motion. United States v. Diebold, Inc., 369 U.S. 654, 655 (1962); Watkins v. Northwestern Ohio Tractor Pullers Ass'n, 630 F.2d 1155, 1158 (6th Cir. 1980). Additionally, "unexplained gaps" in materials submitted by the moving party, if pertinent to material issues of fact, justify denial of a motion for summary judgment. Adickes, 398 U.S. at 157-60.

If the moving party meets its burden and adequate time for discovery has been provided, summary judgment is appropriate if the opposing party fails to make a showing sufficient to establish the existence of an element essential to that party's case and on which that party will bear the burden of proof at trial. Celotex, 477 U.S. at 322. The existence of a mere scintilla of evidence in support of the opposing party's position is insufficient; there must be evidence on which the jury could reasonably find for the opposing party. Anderson, 477 U.S. at 252.

> When a motion for summary judgment is made and supported as provided in this rule, an adverse party may not rest upon the mere allegations or denials of the adverse party's pleading, but the adverse party's response, by affidavits or as otherwise provided in this rule, must set forth specific facts showing that there is a genuine issue for trial. If the adverse party does not so respond, summary judgment, if appropriate, shall be

entered against the adverse party.

Fed. R. Civ. P. 56(a).

Accordingly, the motion of an accused infringer for judgment on the ground of non-infringement of a patent may be granted where the patentee's proof is deficient in meeting an essential part of the legal standard for infringement. Johnston v. IVAC Corp., 885 F.2d 1574, 1577 (Fed.Cir. 1989). Upon review of the record, the Court determines that this is such a case.

II. PLAINTIFF'S INVENTION

The patents under consideration concern mine roof bolts which were prosecuted by Frank Calandra, assignor to plaintiff. Patent 885 is a continuation of patent 292, both of which were granted in May, 1985. Patent 292 is a division of patent 805, a "method patent," which was prosecuted in the early 1980's. The mine roof bolt invented by Mr. Calandra is a device which both mechanically anchors and resin bonds a bolt into a rock formation. The device and its operation are described in all the relevant patent abstracts as follows:

> A mechanical anchor including an expansion shell and a camming plug positioned in the shell is threaded onto the end of a mine roof bolt. A roof support plate is carried on the opposite end of the bolt. The mechanical anchor is inserted in a bore hole drilled in a rock formation with one or more resin cartridges advanced by upward movement of the bolt to the end of the bore hole. The cartridge is ruptured by upward thrust and rotation of the bolt to release the resin components for mixing. A stop device extending through the plug abuts the end of the bolt to prevent axial movement of the plug on the bolt when the bolt is rotated in a preselected direction to mix the resin components

> before the shell is expanded. Rotation of the bolt continues without expansion of the shell for a period of time to permit formation of a curable resin mixture. As the resin mixture begins to harden rotation of the shell and plug is resisted until the stop device is displaced permitting relative rotation between the plug and the bolt. The plug nonrotatably moves down the bolt upon continued rotation of the bolt in the same preselected direction to expand the shell into engagement with the wall of the bore hole before the resin mixture cures. The cured resin bonds the bolt and expanded shell to the rock formation to resist slippage of the expanded shell and maintain the bolt in tension.

III. THE ACCUSED DEVICE

Defendant's Double Lock bolt was introduced in 1983 and consists of an elongated steel rod ("rebar") which has a square head on one end and threads on the other end. On the threaded end of the bolt in a two-part mechanical expansion shell which consists of a four-pronged shell and a camming plug. The shell is supported by a jam nut which is threaded onto the rebar under the shell.

As stated in the Court's May 1, 1989 Order, the Double Lock bolt is installed in the following manner:

> A hole is drilled ("drill hole") into the mine roof approximately two inches longer than the bolt itself. Elongated plastic cartridges are inserted into the hole. Each cartridge has two separate inner compartments, one containing a resin and the other a catalyst. When the cartridges are in

place, the bolt is inserted into the hole until the roof support plate, which is attached to the square head on the bottom of the bolt, comes into contact with the mine roof. The insertion of the bolt causes the cartridges to break open, causing the resin and catalyst to begin to mix and fill the drill hole around the rebar and expansion shell. A bolting machine rotates the rebar in a clockwise direction, further mixing the resin and catalyst. The expansion shell itself ideally should not rotate due to its close contact with the walls of the drill hole. As the rebar rotates, the camming plug forces the four prongs of the expansion shell to expand and tightly grip the walls of the drill hole. Finally, the resin, mixed with and activated by the catalyst, hardens and further anchors the bolt into the drill hole.

IV. STANDARDS FOR INFRINGEMENT

The patent owner bears the burden of proving infringement by a preponderance of the evidence. SRI International v. Matsushita Electric Corp. of America 775 F.2d 1107, 1123 (Fed. Cir. 1985) ("SRI"). The Federal Circuit Court of Appeals has made it clear that analysis of a patent infringement claim requires two distinct inquiries: (1) what is patented and (2) has the patent been infringed. Specialty Composites v. Cabot Corp. 845 F.2d 981, 986 (Fed. Cir. 1988).

Analysis of the first inquiry requires the Court to interpret the scope of the patent claims at issue and the meaning of the claim language. Id. A major dispute in this case focuses on the interpretation and effect of particular words in the claims of plaintiff's patents. Claim interpretation is necessary to "define the metes and bounds of the protection afforded by the claims," P.M. Palumbo v. Don-Joy Co., 762 F.2d 969, 974 (Fed. Cir. 1985)

("Palumbo"); to gain an understanding of what the inventor actually invented and intended to encompass by the claims. Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1257 (Fed. Cir. 1989). To ascertain the scope of the claim and the true meaning of the claim language, the Court must consider the language of the claim itself, the patent specification, and the file wrapper or prosecution history of the patent. Specialty Composites, 845 F.2d at 986; SRI, 775 F.2d at 1118. Review of other claims in the same patent may also be useful, Specialty Composites, 845 F.2d at 986; SRI, 775 F.2d at 1118, as are copending and continuing applications. Kingsdown Medical Consultants v. Hollister, Inc., 863 F.2d 867, 874 (Fed. Cir. 1988), cert denied, ____ U.S. _____, 109 S. Ct. 2068 (1989).

The specification of an invention must contain a concisely written description of the invention and of the manner and process of making it and using it, and must set forth the preferred embodiment of that invention which is the best mode contemplated by the inventor of carrying out the invention. (See 35 U.S.C. § 112 ¶ 1). The specification is the primary basis for construing claims because the descriptive part of the specification aids in ascertaining the scope and meaning of the claims inasmuch as the words of the claims must be based upon the description. Specialty Composites, 845 F.2d at 987. Only when a specification does not require a limitation should that limitation not be read from the specification into the claim. Id.

The prosecution history of a patent consists of the entire record of the proceedings in the Patent and Trademark office (hereinafter "PTO") including all express representations made to convince the examiner that the invention meets the statutory requirements of novelty, utility and nonobviousness. Standard Oil Co. v. American Cyanamid, 774 F.2d 448, 452-53 (Fed. Cir. 1985). The claims must be read and interpreted with reference to any rejected claims and to the state of the prior art. Graham v. John Deere Co., 383 U.S. 1, 33 (1966). A patentee may not construe a claim narrowly to obtain allowance and then broadly

against an alleged infringer. Jonsson v. Stanley Words, 903 F.2d 812, 821 (Fed. Cir. 1990).

The terms of a claim must be given their ordinary meaning unless it appears that the inventor used them differently, ZMI Corp. v. Cardiac Resuscitator Corp., 844 F.2d 1576, 1579 (Fed. Cir. 1988), and claims should be construed an they would be by those skilled in the art. Specialty Composites, 845 F.2d at 986. If words are defined in the specification, they must be given the same meaning when used in a claim. Jonsson v. Stanley Works, 711 F. Supp. 1395, 1403 (N.D. Ohio 1989), aff'd, 903 F.2d 812 (Fed. Cir. 1990). Also helpful in determining the scope of a claim are remarks made by the applicant's counsel during prosecution of the patent application and comments made by the inventor himself. All of these items must be examined to ascertain the true meaning of what the inventor intended to convey in the claims. Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 867 (Fed. Cir. 1985). If the language of the claim in not disputed, then the scope of the claim may be construed as a matter of law. Palumbo, 762 F.2d at 974. A mere dispute over the meaning of a term, however, does not itself create an issue of fact, even where the meaning cannot be determined without resort to the specification, prosecution history or other extrinsic evidence, "provided upon consideration of the entirety of such evidence the court concludes that there in no genuine underlying issue of material fact." Johnston v. IVAC Corp., 885 F.2d at 1579.

When a claim in written in "means plus function" language directed to a desired result, the Court must refer to the last paragraph of 35 U.S.C. § 112 to determine how to interpret the scope of such a claim. Palumbo, 762 F.2d at 974. Title 35 U.S.C. § 112 ¶ 6 reads as follows:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such

> claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

"Therefore, where a claim sets forth a means for performing a specific function, without reciting any specific structure for performing that function, the structure disclosed in the specification must be considered...." Data Line Corp. v. Micro Technologies, Inc., 813 F.2d 1196, 1201 (Fed. Cir. 1987). The Court may not, however, in interpreting the "means plus function" limitations in a claim, say that only the particular means set forth in the specification is relevant. D.M.I., Inc. v. Deere & Co., 755 F.2d 1570, 1574 (Fed. Cir. 1985). Although patentees must disclose in the specification some enabling means for accomplishing the function set forth in the "means plus function" limitation, the applicant is not required to describe or predict every possible means of accomplishing that function. Id.

Once the scope of the claims is determined without reference to the accused device, then the Court must decide whether the patent, so interpreted, encompasses the accused device. Mannesmann Demag Corp. v. Engineered Metal Products Co., Inc., 793 F.2d 1279, 1282 (Fed. Cir. 1986). Infringement is determined by comparing the accused device not with the preferred embodiment of the patented device, but with the properly construed claims. SRI, 775 F.2d at 1121. Summary judgment may be entered in a patent case when "a properly interpreted claim with an uncontested description of the accused device reflects the absence of a genuine issue of material fact." Palumbo, 762 F.2d at 973. The determination of infringement is a question of fact, Fromson v. Advance Offset Plate Inc., 720 F.2d 1565, 1569 (Fed. Cir. 1983), and a motion for summary judgment on that issue should be approached with "a care proportioned to the likelihood of its being inappropriate." SRI, 775 F.2d at 1116.

When a patentee claims literal infringement, as in this case, the patentee must establish that every limitation set forth in the patent claims is found in the accused device or process. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1054 (Fed. Cir.), cert. denied, ____ U.S. ____, 109 S. Ct. 75 (1988); Texas Instruments, Inc. v. United States International Trade Commission, 805 F.2d 1558, 1562 (Fed. Cir. 1986) ("Literal infringement requires that the accused device embody every element of the claim as properly interpreted."). Mere assertion of similarity in the two devices is not enough to succeed on a claim of literal infringement, Johnston v. IVAC Corp., 885 F.2d 1574, 1577-78 (Fed. Cir. 1989). If the patentee's claims are written in "means plus function" language, literal infringement may also be found when the accused device is "equivalent" under 35 U.S.C. § 112. "If all other limitations in such a claim are literally met, and the accused device is shown to contain an equivalent of the structure identified in the means-plus-function limitation of the claim and disclosed in the specification, infringement is said to be 'literal'...." Data Line Corp. v. Micro Technologies, Inc., 813 F.2d 1196, 1201 (Fed. Cir. 1987); see also King Instrument Corp. v. Otari Corp., 767 F.2d 853, 862 (Fed. Cir. 1985), cert denied, 475 U.S. 1016 (1986). Although a patentee is not required to describe or predict every possible means of accomplishing the stated function, D.M.I., Inc. v. Deere & Co., 755 F.2d at 1574, § 112 ¶ 6 does not expand the scope of a claim because to do so may encompass any means for performing the function. Johnston v. IVAC Corp., 885 F.2d at 1580; Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 934 (Fed. Cir. 1987) (en banc), cert. denied, 485 U.S. 961 and 1009 (1988). Rather, § 112 ¶ 6 operates to "cut back" on the types of means which could literally satisfy the claim language. Johnson v. IVAC, 885 F.2d at 1580. "For a means-plus-function limitation to read on an accused device, the accused device must incorporate the means for performing the function disclosed in the specification or a structural equivalent of that means, plus it must perform the identical function." Id. If the required function is not performed exactly in the accused device, then there in no § 112 ¶ 6

equivalency. Pennwalt, 833 F.2d at 934.

If literal infringement is not found the Court may consider whether or not to apply the equitable doctrine of equivalents to prevent what is in essence a pirating of the patentee's invention. Loctite Corp. v. Ultraseal Ltd., 781 F.2d, at 870. Infringement under the doctrine of equivalents depends on whether the accused device or process performs substantially the same function in substantially the same way to achieve substantially the same result. Graver Tank & Manufacturing Co. v. Linde Air Products Co., 339 U.S. 605, 608-09 (1950); SRI, 775 F.2d at 1124. However, even if this test is met there in no infringement if the asserted scope of equivalency of what is literally claimed would encompass the prior art. Pennwalt, 833 F.2d at 934 n. 1; Senmed, Inc. v. Richard-Allan Medical Industries, 888 F.2d 815, 821 (Fed. Cir. 1989). Moreover, prosecution history estoppel will not allow the patentee to recapture through equivalence that coverage given up during prosecution. Loctite Corp. v. Ultraseal Ltd., 781 F.2d at 870.

Furthermore, equivalence under the doctrine is not established simply by showing accomplishment of the same result because results are abstractions which cannot be patented. Texas Instruments v. U.S. Intern. Trade Comm'n, 805 F.2d at 1571. Whereas in the case of literal infringement of a claim containing a "means" clause in terms of 35 U.S.C. § 112 ¶ 6 the accused structure, composition, or process is compared with that described in the specification for performing the claimed function, in the case of infringement under the doctrine of equivalents, the accused structure, composition or process is compared with the claimed invention as a whole. Id.

V. CLAIM CONSTRUCTION

The threshold requirement in claim construction is an examination of the claims at issue because it is the claim which measures the invention. Aro Manufacturing Co., Inc. v. Convertible Top Replacement Co., Inc., 365 U.S. 336, 339

(1961).

As stated previously, claims must be read and interpreted with reference to the prior art. Graham v. John Deere Co., 389 U.S. at 33. Prior art is already in the public domain and is available when it is described in accessible literature, including patents, or has been publicly known or in the public use or on sale. Kimberly-Clark Corp. v. Johnson & Johnson, 745 F.2d at 1453. Prior art "is knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." (Id). A claim which is broad in view of prior art will be limited by construction to the patentee's actual invention because a patentee cannot obtain greater coverage by failing to describe his invention than by describing it as the patent laws require. See Halliburton Co. v. Walker, 329 U.S. 1, 12-13 (1946).

Mine roof bolts have been known in the art of mine roof support to anchor in bore holes drilled in a mine roof to reinforce the unsupported rock above the roof. It is undisputed that mine roof bolts combining mechanical and resin anchoring are included in the prior art. It in also undisputed that the prior art teaches that resin will be mixed, in part, by the mere placement of the bolt into the bore hole. Prior art includes a bolt having a threaded end portion; a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt upon rotation of said bolt in a preselected direction; an expandable shell having a plurality of longitudinally extending fingers each having an inner surface and an outer surface, a portion of said inner surface abutting a portion of the camming plug outer surface and a portion of the finger outer surface adapted to engage the wall of a bore hole; expandable shell fingers arranged to expand outwardly to engage the outer surface of the fingers to the wall of a bore hole by longitudinal movement of the camming plug relative to the bolt threaded end portion and the expandable shell; and a means for

moving the camming plug axially on the bolt threaded end portion.

A. THE 292 PATENT

1. The Claim Language

Plaintiff alleges that defendant's device is the equivalent of the embodiment of plaintiff's invention as described in the 292 patent wherein independent claims 1, 4 and 6 are specifically written in "means plus function" language which calls for a means to perform a stated function. Claim 1 reads as follows:

> A bolt assembly for securing a bolt in a bore hole having a bonding material therein comprising,
>
> bonding material adapted to be positioned in an unmixed condition in a bore hole,
>
> a bolt having a threaded end portion,
>
> a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt upon rotation of said bolt in a preselected direction,
>
> an expandable shell having a plurality of longitudinally extending fingers,
>
> said fingers each having an inner surface and an outer surface, a portion of said inner surface abutting a portion of said camming plug outer surface and a portion of said finger outer surface adapted to engage the wall of said bore hole,
>
> said expandable shell fingers arranged to expand

outwardly to engage said outer surface of said fingers to the wall of said bore hole by longitudinal movement of said camming plug relative to said bolt threaded end portion and said expandable shell,

means for mixing at least a portion of said bonding material in said bore hole upon rotation of said bolt in said preselected direction in said bore hole while maintaining said expansion fingers in an unexpanded condition, and

means for moving said camming plug axially on said bolt threaded end portion and relative to said expandable shell fingers upon rotation of said bolt in said same preselected direction to expand said fingers and anchor said bolt in said bore hole.

(emphasis added). Claim 4 reads as follows:

bonding material adapted to be positioned in a substantially unmixed condition in a bore hole,

a bolt having a threaded and portion,

a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt in a direction away from said end of said bolt threaded end portion upon rotation of said bolt in a preselected direction,

an expandable shell having a plurality of longitudinally extended fingers,

said fingers each having an inner surface and an outer surface, a portion of said finger inner surface abutting said camming plug outer surface and a portion of said finger outer surface adapted to engage the wall of said bore hole,

said expandable shell fingers arranged to expand outwardly to engage said outer surface of said fingers to the wall of said bore hole by longitudinal movement of said camming plug relative to said bolt threaded end portion and said expandable shell, and

means for mixing at least a portion of said bonding material in said bore hole upon rotation of said bolt in said preselected direction in said bore hole while maintaining said camming plug fixed relative to said expandable shell.

(emphasis added). Claim 6 reads as follows:

A bolt assembly for securing a bolt in a bore hole having a bonding material therein comprising,

bonding material adapted to be positioned in an unmixed condition in a bore hole,

a bolt having a threaded end portion,

a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt upon rotation of said bolt in a preselected direction,

an expansion shell having a lower ring portion and a plurality of expansion fingers extending upwardly therefrom,

said fingers each having an inner surface and an outer surface, a portion of said inner surface abutting said camming plug outer surface and a portion of said outer surface adapted to engage the wall of said bore hole,

said expansion shell positioned on the threaded end portion of said bolt and engaging said camming plug,

means for mixing at least a portion of said bonding material in said bore hole upon rotation of said bolt in said preselected direction in said bore hole while maintaining said camming plug fixed relative to said expansion shell, and

means for moving said camming plug on said bolt upon further rotation of said bolt in said preselected direction to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

(emphasis added).

Plaintiff maintains that the "means plus function" language of these claims, which the Court has underlined, calls for a means for mixing resin inside a bore hole during rotation of a bolt while maintaining the expansion shell fingers unopened or fixing the camming plug relative to the expansion shell, and for a means for moving the camming plug to anchor the bolt upon further rotation of the bolt in the same direction. (Plaintiff's Opposition to Defendant's Motion for Partial Summary Judgment No. 3, p. iv). To find the scope of the limitations "means for mixing...while maintaining..." and "means for moving...," the Court must now look to the specification. Data Line Corp. v. Micro Technologies, Inc., 813 F.2d at 1201-02.

2. The Patent Specification

Although patent claims are the measure of a patent grant, another helpful factor in claim construction is the use of the patent specification which aids in ascertaining the scope and meaning of the claim language inasmuch an words must be used in the same way in both the claims and in the specification. Jonsson v. Stanley Works, 711 F. Supp. at 1405. "The use of the specification as a concordance for the claims is accepted by almost every court, and in a basic concept of patent law." Id. (citation omitted).

Plaintiff concedes that the specification in the 292 patent describes a specific embodiment of the invention which uses a shear pin to perform the function defined in Claims 1, 4 and 6 which must be broken when a certain predetermined torque is reached before the plug can move relative to the expansion shell. Plaintiff argues, however, that the invention is defined in the specification as being of a much broader scope than the structure of the preferred embodiments so as to encompass other means that could be used for accomplishing the same results. Specifically, plaintiff argues that the stop means can include any suitable device that restrains axial movement of the plug on the bolt beyond a preselected point on the threaded end portion of the bolt. As stated in the specification, "it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described." (Column 12, Lines 59-62).[1]

At numerous points in the specification, the patentee describes his method of maintaining the camming plug fixed or maintaining the expansion shell in an unexpanded condition to mix the resin components. In each instance, the patentee uses the following terms to describe whatever means it is to "maintain" or

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[1] A copy of the specification can be found at Exhibit A to Defendant's Motion for Partial Summary Judgment No. 3.

"fix" the specific parts of his invention: "displaced" or "displacement" (e.g., col. 3, line 30; col. 5, lines 11, 15 and 25); "shear," "shearable" or "shearing" (e.g., col. 3, line 60-61; col. 4, lines 37 and 47; col. 8, line 58); "fractures," "to fracture" or "fracturing" (e.g., col. 4, line 23; col. 6, line 20, col. 7, line 2; col. 8, line 58; "restrains" or "to restrain" (e.g., col. 5, lines 21 and 36; col. 6, lines 16 and 58; col. 10, line 12); "extending through" and "retained in," "to abut" and "abutting" (e.g., col. 5, lines 56, 60, 64 and 65; col. 6, lines 7 and 8); "yielding" or "bending," and "break" or "breakable" (e.g., col. 10, lines 15, 16, 22, 29, 40 and 43); "obstruction" (e.g., col. 10, line 15 and 29); and "device" (col. 10, line 11 and 12).

At numerous places in the specification it is noted that the shear pin or other device or obstruction permits "complete mixing" of the resin components (e.g. col. 5, line 11; col. 6, lines 63-64; col. 9, line 68 and col. 10, line 1; col. 11, lines 33 and 40-41).

The specification calls for two sequential operations although the bolt is continuously rotated in only one direction (see, e.g., col. 5, line 30; col. 12, line 12). The specification indicates that it is "the stop device associated with the camming plug 52 [which] substantially improves the efficiency and case of installation of a roof bolt that is both mechanically anchored and resin bonded within a bolt bore hole." (Col. 12, lines 44-48).

3. The Prosecution History

As stated previously, the abstract filed by Mr. Calandra in application for this patent reads in part as follows:

> The [resin] cartridge is ruptured by upward thrust and rotation of the bolt to release the resin components for mixing. A stop device extending through the plug abuts the end of the bolt to prevent axial movement of the plug on the bolt when the bolt is rotated in a preselected direction to mix the resin components before the shell is

> expanded. Rotation of the bolt continue without expansion of the shell for a period of time to permit formation of a curable resin mixture. As the resin mixture begins to harden rotation of the shell and plug is resisted until the stop device is displaced permitting relative rotation between the plug and the bolt. The plug nonrotatably moves down the bolt upon continued rotation of the bolt in the same preselected direction to expand the shell into engagement with the wall of the bore hole before the resin mixture cures....

These words give life and meaning to the claims at issue and provide positive limitations to the invention claimed. Corning Glass Works v. Sumitomo, 868 F.2d at 1257.

Patent 292 was applied for as a "division" of existing patent 805 which the Court construed in its May 1, 1989 Order.

> A division or divisional application is a later application for a distinct or independent invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in the earlier or parent application.

Chisum, Patents, § 13.03[4]; see also 37 C.F.R. § 1.60(a).

Besides being a division of 805, the patent applicant specifically cross-referenced the application for 292 to patent 805 (File Wrapper, p. 59). In referring to the application made for resulting patent 805, applicant's attorney stated as follows:

> It is believed by the Applicant that the relevancy of the prior art cited by the Applicant in the prior application [805] to the claims in the present application [292] does not differ from the relevancy to the claims of the prior application

> [805].... The relevancy of the above-listed prior art to the subject matter of the claims of the present invention [292] is not considered to differ from its relevancy as explained in the prior application [805].

Id. at 70 (emphasis added). The prosecution history of patent 805 includes patentee's attempt to distinguish his claims from the prior art references by stressing the importance of the "stop means." (See Court's May 1, 1989 Order).

Furthermore, in the applicant's Supplemental Information Disclosure Statement, applicant's attorney also tied the instant application to another prior application which became patent 930, also construed in the Court's May 1, 1989 order, by stating: "Also related to the instant application is prior application Serial No. 238,760 filed on February 27, 1981, entitled 'Method and Apparatus For Combining Resin Bonding and Mechanical Anchoring of a Bolt in a Rock Formation,' and now United States Patent 4,413,930 which issued November 8, 1983." (File Wrapper at 73). Patent 930 is also referenced in the application for 292 through a terminal disclaimer filed in May 1984 which specifically "disclaims the terminal part of any patent granted on the above-identified instant application [292] which would extend beyond the expiration date of [930]." (Id. at 75-76). The purpose of a terminal disclaimer is to avoid a rejection based on obviousness of the same invention which would have the effect of extending the patent monopoly beyond the expiration date of the earlier patent. In re Kaplan, 789 F.2d 1574, 1579-80 (Fed. Cir. 1986). The prosecution history of patent 930 discloses that patentee distinguished his invention from the prior art by the stop means employed, and described the Instal Bolt as "described and claimed in the instant application." The Instal bolt, of course, includes a definite stop means/shear pin. (See, Court's May 1, 1989 Order).

At first, the 292 application was rejected by the Patent and

Trademark office on the grounds of obviousness and anticipation. Rejection was based on anticipation in that Hipkins disclosed

> an apparatus for anchoring a bolt in a bore hole which includes means for positioning expansion shell 22,23 in surrounding relation with camming plug 13', threadedly engaging the plug on bolt 16 (see column 6, lines 34-36), rotating the bolt 16 in a fixed relation with shell 22,23 until resin 26 firms and thereafter further rotating the bolt to expand the shell fingers 22 (see column 6, lines 41-55).

(File Wrapper, pp. 117-118). Rejection was also based on obviousness in that

> Montgomery '898 discloses an anchor bolt assembly wherein the expansion shell has extending fingers and a camming plug that moves relative to the bolt and fingers. In addition, Montgomery '898 discloses the concept of allowing the resin adhesive to flow downwardly around the fingers and bolt to secure them. It would be obvious to allow the resin in Hipkins to flow down around the expansion fingers and bolt and secure them in view of the teaching of Montgomery '898. With regard to claim 27, note in Hipkins that the camming plug is internally threaded and will move axially on the bolt if the bolt is rotated in a preselected direction.

The patentee thereafter revised his claims and resubmitted his application. In his revision, patent applicant deleted all claims referring specifically to a "stop means" (Id. at 39-52) and inserted "means plus function" language. In the "Remarks" portion of the reapplication, plaintiff's attorney emphasized the claim language

"means for mixing...while maintaining" and "means for moving the camming plug..." and "means to apply a tension...." Furthermore, patentee specifically referred to the commercial embodiment of 292 which includes a stop means, as follows: "Applicant's bolt assembly has attained commercial success and has fulfilled a long felt need." (Id. at 135).

All drawings used by applicant to prosecute the 292 patent are the exact same drawings as those used to prosecute patents 805 and 930, all of which include depictions of a tangible stop means in the camming plug. The fact that identical drawings accompany different patent applications is persuasive evidence that only one inventive concept is present. See Transmatic, Inc. v. Gulton Industries, Inc., 442 F. Supp. 911 (E.D. Mich. 1977), rev'd on other grounds, 601 F.2d 904 (6th Cir. 1979).

4. Analysis of 292 Claims

Defendant argues that the prosecution history of 292, the language of Claims 1, 4 and 6, the drawings, attorney comments and the specification indicate that although no stop means or shear pin is explicitly recited in Claims 1, 4 or 6, it is undeniable that the only means illustrated to practice the claimed invention is some tangible physical element or device inserted within the camming plug to maintain the shell unexpanded or fix the camming plug in position during the resin mixing stage. Defendant contends that something tangible must stop or maintain the fingers unexpanded to satisfy Claim 1 and must stop or maintain the camming plug fixed to satisfy Claims 4 and 6. Intervenor argues that the claims of the 292 patent require something which functions like the disclosed shear pin or bendable wire in causing temporary but controlled unified rotation of the bolt, shell and plug. Plaintiff counters that a shear pin or other device is only one embodiment of the invention and should not be read into the claim itself.

Although plaintiff concedes that means for "mixing... while maintaining" in done in the 292 embodiment by a shear pin

mounted on the threaded opening of the camming plug and that means for moving the camming plug on the bolt is done only after the shear pin is broken, (Plaintiff's Opposition at 19-20), it argues that Claims 1, 4 and 6 are so broadly written that a question of fact arises as to whether a shear pin or other obstruction can be read into Claims 1, 4 and 6.

Despite plaintiff's contentions, the Court finds that there is no genuine issue of material fact concerning the construction of Claims 2, 4 and 6; there is no "evidentiary conflict created on the record," SRI, 775 F.2d at 1116, as to the meaning of "means for mixing...while maintaining [or fixing]" as set forth in the Claims.

Claims 1, 4 and 6 are apparatus claims written in "means plus function" language which calls for "a means for mixing resin inside a bore hole during rotation of a bolt while maintaining the expansion shell fingers unopened or fixing the camming plug relative to the expansion shell...[and] a means for moving the camming plug to anchor the bolt upon further rotation of the bolt in the same direction." (Plaintiff's memorandum in opposition to motion for partial summary judgment No. 3. p. iv). Although plaintiff argues that a shear pin or similar device should not be read into Claims 1, 4 and 6, plaintiff concedes, while arguing that defendant's device is the equivalent of the embodiment of the 292 patent, that 292 has "a shear pin [which is] located in the camming plug [which] prevents it from rotating relative to the expandable fingers until a predetermined torque in reached, at which time further rotation in the same direction will brake (sic) the shear pin and allow the camming plug to expand the fingers and anchor the bolt in place." (ID. at vi-vii).

The language of the claims clearly indicates that the inventor intended more than a mere uncontrolled rotation of the shell. Although plaintiff argues that other embodiments can fall within the scope of its broadly written claims, the Court concludes that Claims 1, 4 and 6 clearly contemplate some tangible physical device which reliably maintains the shell unexpanded or fixes the

camming plug in position during the mixing stage and which is thereafter displaced or overcome at a predetermined point to permit movement of the camming plug to effect expansion of the shell. Plaintiff's claims contemplate a means which assures the intentional rotation of the shell during the mixing phase of installation.

Plaintiff's claims set forth means for performing specific functions but do not recite a specific structure for accomplishing those functions. Accordingly, the Court must look to the structure disclosed in the specification for the enabling means for accomplishing those specific functions. 35 U.S.C. § 112 ¶ 6; Data Line Corp. v. Micro Technologies, Inc., 813 F.2d at 1201; D.M.I., Inc. v. Deere & Co., 755 F.2d 1574. Whenever the patentee refers to the means which cause mixing of the bonding materials while maintaining the expansion fingers in an unexpanded condition or the camming plug fixed relative to the expansion shell, and which then permits the camming plug to move to expand the shell to anchor the bolt, the patentee uses words which, using their ordinary meaning, can only be accomplished by some tangible physical device. These words include different forms of the words displace, shear, fracture, restrain, yield, band, break, extend through, and retained in. The method for performing the function is referred to as a "device" or an "obstruction"; words which clearly indicated a tangible, physical, intentionally-placed object of some kind. Although the particular means described in the specification such as steel or aluminum shear pins or bendable wires may not be the only means to practice what 292 teaches, it cannot be disputed from consideration of the language of the claims, the specification and the prosecution history of 292, that some kind of intentionally placed, tangible object is contemplated as the means in Claims 1, 4 and 6. Moreover, the "material composition" and "structural design" of this tangible, displaceable object is capable of being selected "in accordance with the curing time of the particular type of bonding material utilized." (File Wrapper at 26).

B. THE 885 PATENT

1. The Claim Language

Plaintiff alleges that defendant's device infringes upon independent Claims 1, 2 and 5 and all dependent claims set forth in patent 885. Claim 1 reads as follows:

> A method of anchoring a bolt in a bore hole comprising the steps of,
>
> positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,
>
> positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end of said threaded portion of said bolt in a manner that said camming plug is movable longitudinally on said bolt threaded portion,
>
> inserting a bonding material into a bolt [sic] hole,
>
> inserting said bolt with said camming plug threadedly engaged thereto into a bore hole,
>
> rotating said bore [sic] in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and
>
> thereafter rotating said bolt in said same

preselected direction and moving said camming plug on said bolt to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

(emphasis added). Claim 2 reads as follows:

A method of anchoring a bolt in a bore hole comprising the steps of,

positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,

positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end portion of said threaded portion of said bolt,

inserting a bonding material in an unmixed condition into a bore hole, inserting said bolt with said camming plug threadedly engaged thereto into said bore hole,

rotating said bolt in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and

thereafter rotating said bolt in said same preselected direction and moving said camming plug relative to said bolt on said bolt threaded end portion to expand the fingers of said expansion

shell and apply a tension to said bolt in said bore hole.

(emphasis added). Claim 5 reads an follows:

> A method of anchoring a bolt in a bore hole comprising the steps of,
>
> positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,
>
> positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end of said threaded portion of said bolt to form a bolt assembly,
>
> inserting a cartridge of unmixed bonding material into said bore hole,
>
> thereafter inserting said bolt with said camming plug threadedly engaged thereto into said bore hole,
>
> breaking said cartridge of unmixed bonding material with said bolt assembly,
>
> rotating said bolt in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and
>
> thereafter rotating said bolt in said same

> preselected direction and moving said camming plug downwardly on said bolt in a direction away from the end of said bolt threaded portion to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

The words "maintaining" and "fixed" are common to all three independent claims. The Court will next examine the specification in order to ascertain the scope and meaning of this language.

2. The Patent Specification

The specification for this patent clearly describes the manner and process of making the invention work.

The patentee explains throughout the specification for patent 885 that the bolt is continuously rotated in the same preselected direction for a period of time sufficient to complete mixing of the components of the bonding material through the use of a stop device which prevents expansion of the shell assembly during the mixing state and which is thereafter displaced or fractured when the torque applied to the bolt exceeds a predetermined torque, as determined by the time necessary to mix the bonding material. Although pursuant to the specification the "stop means" may be made from various materials depending on the type of bonding material used, and may be placed differently in the mechanism, some definite physical structure is called for to assure position of the camming plug in relation to the expansion shell during the mixing period before that physical structure is displaced or fractured to permit movement of the camming plug to expand the shell. In the specification, the emphasis is on the invention's ability to assure complete mixture of the bonding materials before the fingers of the expansion shell are expanded to engage the walls of the bore hole.

The abstract portion of patent 885 reads as do all

previously discussed patents, referencing a stop means. In the summary of his invention, Mr. Calandra explains precisely how the bolt is able to rotate to effect complete mixture of the bonding materials while the camming plug is maintained in fixed relation to the expansion shell and how the camming plug is then able to move to expand the shell.

> Stop means associated with the camming plug prevents axial movement of the camming plug on the bolt upon rotation of the bolt in a preselected direction. The stop means is arranged to be displaced by the bolt upon continued rotation of the bolt in the preselected direction when a torque in access of a predetermined torque is applied to the bolt. The camming plug is then movable upon displacement of the stop means to expand the fingers to anchor the bolt in the bore hole. ...The stop means in one embodiment includes a shearable pin extending through a bore of the camming plug. ...The end of the bolt abuts the pin to prevent initial downward movement of the plug on the bolt during rotation of the bolt to effect mixing of the adhesive components.
>
> With the camming plug being restrained from downward movement on the bolt there in no relative rotation between the camming plug and the bolt. Thus the bolt, camming plug, and shell rotate as a single unit to effect mixing of the adhesive components in the bore hole. ...The presence of the shear pin prevents downward movement of the camming plug on the bolt for the period of time required to complete mixing of the resin components. For a quick setting type of adhesive material expansion of the shell is delayed for about 20 to 30 seconds to permit complete mixing of the adhesive components before the

shell is expanded.

....

...The stop means in the embodiment of a shearable pin is constructed of a preselected material and has a preselected cross sectional area to control the material strength of the pin. Thus the pin is operable to fracture when the mixing stage is complete and before the resin mixture hardens. This assures that the shell will expand before the resin cures and after the resin is completely mixed.

....

The stop means in one embodiment includes a pin fabricated of aluminum and having a preselected diameter. In another embodiment the stop means includes a steel pin having a length and diameter differing from that of the aluminum pin because of the difference in material strength of aluminum and steel.

...In each case by selecting the material composition and size of the pin, as well as, the position of the pin, the fracturing or shearing of the pin is controlable [sic] to meet the specifications of the resin system utilized. Thus a stop means is provided to permit mixing of the resin system for the period of time required for the selected resin system used before the shell is expanded upon continuous rotation of the bolt in one direction.

(File Wrapper at Column 3, lines 40-48, 63-64, and 68; Column 4, lines 1-8, 11-18, 39-46, 54-59, 63-68; Column 5, lines 1-3).

Furthermore, as with the 292 patent, when the patentee describes his method of "maintaining in fixed relation," the patentee uses descriptive words appropriate only for some tangible device or structure.

3. The Prosecution History

The application for patent 885 was filed as a continuation of patent 292, which is a division of patent 805. Claim 1, 2 and 5 were initially rejected on the grounds of being anticipated by Hipkins pursuant to 35 U.S.C. § 102(b). The PTO, in rejecting these claims wrote as follows:

> Hipkins discloses a method of anchoring a bolt in a bore hole which includes the steps of positioning expansion shell 22,23 in surrounding relation with camming plug 13', threadedly engaging the plug on bolt 16 (see column 6, lines 34-36), rotating the bolt 16 in a fixed relation with shell 22,23 until resin 26 firms and thereafter further rotating the bolt to expand the shell fingers 22 (see column 6, lines 41-55).

Applicant thereafter amended his application to "include the step of moving the camming plug relative to the bolt to expand the fingers of the expansion shell," (Id. at 125) and added the phrase "to mix at least a portion of said bonding material." Applicant's attorney distinguished the stop means in Hipkins as the arrangement of "[t]he transition point between the threaded stem portion 14 on bolt 12 and the unthreaded stem portion 16" and "a frustoconical wedge 13' which is threadedly received on the stem portion 14 of bolt 12 and seats against threaded stop 20." (Id. at 124). Furthermore, the "Remarks" portion of the amendment asserted that "Applicant's claimed method has attained commercial success and fulfilled a longfelt need." (Id. at 127-28). Applicant's claimed method undisputably refers to the Instal Bolt which

contains a shear pin.

Patentee also filed a terminal disclaimer which specifically ties 885 to previously discussed 805 and specifically cross-referenced the application for 885 to 805. (Id. at 59 and 106-07). Patent 805 includes in its prosecution history patentee's attempt to distinguish his claim from the prior art references by stressing the importance of the shear pin/stop means.

In the Supplemental Information Disclosure Statement filed in the application for 885, patentee's attorney responded to the examiner's reference to the Brown patent, an relevant for the disclosure of the use of a shear pin on a mine roof support bolt to provide a way to rupture, mix and cure the resin before the bolt is tightened, as follows:

> The Brown reference does not disclose or suggest the features of pending claims 15-19 directed to an expansion shell and camming plug used with bonding material where the bonding material is mixed by rotation of the bolt while maintaining the expansion fingers in an unexpanded condition and means for expanding the fingers by movement of the plug axially on the bolt. For this reason claims 15-19 are considered to be patentable over the Brown reference.

(File wrapper at 93). Moreover, the attorney, in the Preliminary Amendment and Prior Art Statement (id. at 94-96) incorporated the prior art statement of patent 805. "It is believed by the Applicant that the relevancy of the prior art cited by the Applicant in the prior application [805] to the claims in the present [885] application does not differ from the relevancy to the claims of the prior application [805]." (Id. at 95).

4. Analysis of 885 Claims

Defendant and intervenor argue that the inventor's use of the word "fixed" in each relevant independent method claim, his emphasis in the specification, drawings, and the prosecution history, require that some tangible means be provided to practice the 885 invention. Although plaintiff argues that the claim language in 885 is broader than that in the parent application, plaintiff concedes that all of its patents describe a shear pin. (Plaintiff's opposition to defendant's motion partial summary judgment No. 4 at 2). Plaintiff argues, however, that

> ... the fact that they all describe a shear pin does not necessarily mean that an accused device must include a shear pin before there can be infringement. Instead, as addressed below, the test is whether the accused device is within the scope of the patent claims, literally or as an equivalent, not whether it is identical in all respects to the embodiments described in the patent.

(Id. at 2-3). It appears to the Court that the emphasis of plaintiffs arguments are on the infringement issue rather than on claim interpretation. Plaintiff does contend, however, that the relevant claims of 885 do not include the features found in the 930 and 805 patents which are "stop means to be associated with the camming plug and removed from engagement with the shell and/or displaceable... " (id. at 3), but that the functional intent of such stop device is to effect mixing of the resin before the shall is expanded. (Id. at 13-14); Column 12, lines 28-34).

In the Court's view, the 885 patent clearly contemplates a method for installing a mine roof bolt wherein upon initial rotation of the bolt the camming plug and expansion shell remain in a certain position to each other in order to mix the bonding materials and thereafter, while the bolt is still rotating in the same direction, the camming plug becomes free to move on the bolt to effect

expansion of the shell. The language of the claims indicates that the patentee intended more than mere uncontrolled shell rotation. Although Claims 1, 2 and 5 do not specifically call for a "stop means" as the claims in patents 805 and 930 do, the claims call for something which assures that the camming plug and the expansion shell are maintained in "fixed relation" to each other through the mixing process and which thereafter is released or overcome to permit independent movement of the camming plug upon the bolt. Based on a thorough examination of the claim language, specification and prosecution history, the Court concludes that the 885 patent clearly contemplates some tangible, displaceable device which assures that the camming plug and expansion shell are maintained in fixed relation to each other during the mixing process and which is thereafter released or overcome to permit completion of the anchoring of the bolt. The Court does not interpret "maintaining ... in fixed relation" upon the preferred embodiment suggested by the drawings or specification. Although Claims 1, 2 and 5 may not require a specific shear pin, by their own terms, they contemplate a tangible, displaceable device capable of assuring that the camming plug and the expansion shell remain in a fixed relation to each other during the mixing process.

IV. INFRINGEMENT

Once an interpretation has been made, that same interpretation must be used in determining infringement. Senmed, Inc. v. Richard-Allan Medical Industries, 888 F.2d at 818. Having interpreted the claims at issue, the Court turns to the issue of infringement. Infringement may be established in one of two ways: literal infringement or by the doctrine of equivalents. Although infringement is a question of fact, the Court finds that in comparing defendant's device to plaintiff's properly construed claims, there are no genuine issues of material fact present and

defendant is entitled to summary judgment as a matter of law.[2]

A. LITERAL INFRINGEMENT

Plaintiff claims that defendant's mine roof bolt literally infringes upon its patents 292 and 885. Every limitation present in a patented device must be embodied in an accused device before the finding of literal infringement can be made. Builders Concrete, Inc. v. Bremerton Concrete Products Co., 757 F.2d 255, 257 (Fed. Cir. 1985).

1. Patent 292

The claims at issue in the 292 patent are written in "means plus function" language. Title 35 U.S.C. § 112 rules out the possibility that any and every means which performs the function specified literally satisfies that limitation. Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d at 934.

> If the required function is not performed exactly in the accused device, it must be borne in mind that section 112, paragraph 6, equivalency in not involved.... [T]he court must compare the accused structure with the disclosed structure, and must find equivalent structure as well as identity of claimed function for that structure.

Id. (emphasis in original).

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[2] Because the Court finds no infringement on plaintiff's independent claims, the Court need not address plaintiff's dependent claims. See, Wahpeton Canvas Co., Inc. v. Frontier, Inc., 870 F.2d 1546, 1552 n.9 (Fed. Cir. 1989).

The Court has already construed the claims in patent 292 as requiring some tangible, displaceable structure as the means for mixing the resin while maintaining the expansion fingers in an unexpanded condition or the camming plug fixed relative to the expansion shell. Defendant's device, as concluded in this Court's May 1, 1989 Order, does not contain such a tangible, displaceable structure. There is no structure in defendant's device, either literally or equivalently, which assures that component parts are reliably maintained in a fixed position during the carefully controlled mixing of the bonding material. Accordingly, defendant's device cannot be said to literally infringe on plaintiff's patent 292.

2. Patent 885

The Court has construed the claims of patent 885 to require a tangible, displaceable component to assure that the camming plug is maintained in fixed relation with the expansion shell during the mixing phase of the anchoring process. As concluded in this Court's May 1, 1989 Order, defendant's device contains no such tangible displaceable component. Accordingly, because defendant's bolt does not embody every element of plaintiff's claims, the Court finds no literal infringement.

B. INFRINGEMENT UNDER THE DOCTRINE OF EQUIVALENTS

Although the Court has found that defendant's device does not literally infringe on plaintiff's claims, it shall next consider whether infringement can nevertheless be found under the doctrine of equivalents.

> Where a claim does not literally read on an accused device because one or more limitations of the claim are not met exactly, infringement may, nevertheless, be found if such limitations are satisfied equivalently. The accused device may

> then be said to perform substantially the same overall work to achieve substantially the same overall result by substantially the same means.

Johnston v. IVAC Corp., 885 F.2d at 1580-81 (citations omitted).

"It is the limitations and functions of the invention described in the claims, not the elements or functions of the accused device, which establish the reference point for the doctrine of equivalence analysis." Insta-Foam Products, Inc. v. Universal Foam Systems, Inc., ___ F.2d ___, Appeal No. 89-1142, Lexis No. 10182 (Fed. Cir. June 26, 1990). Even if this test in met, however, there can be no infringement if the asserted scope of equivalency of what in claimed would encompass the prior art. Pennwalt, 833 F.2d at 934.

This Court found, in the May 1, 1989 Order, that defendant's bolt contains no device which serves substantially the same function an plaintiff's stop device or which functions substantially the same way or achieves substantially the same result as plaintiff's stop means. The Court found that plaintiff produced no evidence that raised an issue of material fact regarding the comparison between defendant's device and plaintiff's claims. Plaintiff now produces a new theory of equivalence, however, and maintains that new evidence is now available which indicates substantial equivalence.

> What constitutes equivalency must be determined against the context of the patent, the prior art, and the particular circumstances of the case. Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, things for most purposes

> different may sometimes be equivalents. Consideration must be given to the purpose for which an ingredient in used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.

Graver Tank, 339 U.S. at 609.

In response to defendant's motions for partial summary judgment, plaintiff contends that defendant's device includes a structure which is equivalent to the Instal bolt structure in the 292 and 885 patents and performs the identical function. Plaintiff contends that the structure of defendant's device, specifically the adjacent surfaces between (a) the camming plug and bolt threads; (b) expansion fingers and camming plug; (c) jam nut and expansion fingers; and (d) bolt threads and jam nut, create frictional forces which cause the resin to be mixed while maintaining the expansion fingers unexpanded or while maintaining the camming plug fixed relative to the fingers, and which must be overcome before the fingers can expand or the camming plug can move to expand the fingers during initial rotation. Plaintiff contends that spacing the jam nut from the thread runout provides additional structure for performing this function.

> The difference is that for the Double Lock the frictional forces mentioned above cause rotation of the shell until they are overcome to expand the shell, while the Instal bolt has a shear pin which provides greater spin time of the shell until the pin's strength is overcome, after which the shell continues to rotate until the jam nut reaches the thread runout. Additional rotation of the bolt in

> the same direction then expands the fingers and anchors the bolt.

(Opposition by plaintiff to joint motion of defendant and intervenor for partial summary judgment No. 4 and supplement to plaintiff's opposition to defendant's motion for partial summary judgment No. 3, pp. 11-12).

Even if the Court would assume that defendant's bolt components produce friction capable of maintaining the expansion shall unexpanded and in fixed relation to the camming plug during the mixing process, the Court cannot say that a genuine issue of material fact exists regarding the equivalence of such friction to plaintiff's claims.

Plaintiff concedes that the functional intent of its patents and particularly of the stop device is to effect mixing of the resin through rotation of the shell, which, plaintiff argues, is exactly what defendant's device does. (Id. at 14-15). No claim, however, may be drawn merely to a concept. Perkin-Elmer Corp. v. Westinghouse Elec. Corp., 822 F.2d 1528, 1534 (Fed. Cir. 1987). The patentee in this case has developed a specific manner or way of assuring mixture of the resin. See id. That manner of operation, the Court has found, in based on an intentionally incorporated, tangible, displaceable device.

The Court will first consider whether the accused device performs substantially the same way because even if an accused device and a claimed invention perform substantially the same function and achieve the same result, there in no infringement under the doctrine of equivalents where the accused device performs the function and achieves the result in a substantially different way. See Graver Mfg. Co. v. Linde Co., 339 U.S. at 608. This "substantially the same way" prong of the test is met if an equivalent of the recited limitation has been substituted in the accused device. Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1259 (Fed. Cir. 1989). Accordingly, the

Court must consider whether a genuine issue of material fact exists in determining whether defendant's device performs the function of mixing the resin through shell rotation in substantially the same way as called for in plaintiff's claims.

Plaintiff contends that defendant's expert Mr. Vass admitted that while defendant's rebar is rotated, the shell, plug and palnut/jamnut are "held still" to allow resin to be mixed by the outer surface of the rebar. (Plaintiff's opposition to defendant's motion for partial summary judgment No. 3, p. 12). Plaintiff maintains that "[t]his mixing is done by the typical raised-pattern outer surface of the rebar while it is being rotated, and while the fingers of the expansion shell remain in their unexpanded state or the plug is fixed relative to the fingers." (Id.) The Court agrees with defendant, however, that a spinning bolt wherein the bolt mixes the resin is not plaintiff's invention. As stated by plaintiff in its opposition to defendant's motion for partial summary judgment No. 4 and supplement regarding No. 3 at pages 14-15, the functional intent of plaintiff's patents 292 and 885 in to "effect mixing of the resin through rotation of the shell...."

Plaintiff contends, however, that defendant's device also mixes the resin through rotation of the shell. Jerry Frease opines for plaintiff that the operation of defendant's device, of holding the shell, plug and palnut still relative to each other, is utilized by defendant to increase the spin time of the bolt to make sure the resin would be sufficiently mixed. (Id. at 13). Plaintiff contends that the issue raised is whether during initial rotation of defendant's bolt, the plug and shell rotate with the bolt for a period of time to effect mixing of the resin by the shell before the plug expands the fingers. This inquiry, according to plaintiff, is satisfied by the admission of Mr. Vass that "there may be some instantaneous 'slippage' during which the shell rotates a slight bit with the bolt, presumably until the shell fingers firmly contact the rock walls of the hole, as rotation of bolt begins." (See, Vass II, p. 6). Plaintiff contends that although Vass maintains that it is an absolutely uncontrollable and unpredictable event due to many

variables, Vass nonetheless admits to some rotation.

Moreover, plaintiff contends that such rotation is not unpredictable. Plaintiff presents the observations of Mr. Frease which indicate that when tested in a metal pipe, spiral scratches appeared on the inner surface of the test pipe on almost all of the test specimens which indicate rotation of the shell.[3] Frease also indicates that rotation is evident by the fact that defendant's bolt rotates a greater number of times than necessary to move the camming plug to anchor the bolt while the bolt is installed, indicating that if there was not rotation defendant's bolt would fail. In subsequent testing, Mr. Frease observed that although there is greater mixing by the expansion shells of plaintiff's bolts, there was also substantial mixing by the expansion shells of defendant's device.

These subsequent tests by Frease, using cylinders of solid acrylic plastic in which a bore hole was drilled, indicate that "while there is better mixing of resin by the expansion shell with the Jennmar Instal bolts than with the Double Lock bolts, there in also substantial resin mixing by the expansion shell for the Double Lock bolts, even when the jam nut was located at the thread runout." (March 22, 1990 Frease affidavit, p. 7). The number of rotations of the bolt as recorded by Frease in the tests of the Double Lock range from 3 rotations to 15 rotations. (Exhibits 4-6 Frease Affidavit).

In addition to the tests performed by Mr. Frease, plaintiff submits the affidavit of Harry J. Sweet, a consulting engineer with extensive experience in analytical and experimental mechanics. Dr. Sweet agrees with Mr. Frease's conclusions and, in addition, conducted testing of his own to determine the relative behavior of

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[3] As pointed out by defendant, however, there is no indication that the inner surface of these pipes were free from scratch marks prior to testing.

the Double Lock and Instal mine roof bolts during installation. Dr. Sweet concluded that defendant's device, through frictional forces between adjacent components, causes mixing of the resin while maintaining the expansion fingers unexpanded or while maintaining the camming plug fixed relative to the fingers, and for moving the camming plug to expand the fingers and anchor the bolt upon further rotation in the same direction. (Sweet Affidavit at 3). In a letter to plaintiff's counsel, Dr. Sweet maintains that the "difference between the Double Look and Instal bolts is that the Instal bolt relies on a shear pin to maintain the expansion shell in an unexpanded position for the first few rotations while the Double Lock relies on adjacent component surfaces that resist relative motion through friction." (Exhibit B to Sweet Affidavit). Furthermore, Dr. Sweet wrote:

> From a practical point of view, the shear pin is more visible and more reliable. Friction between the various components is certainly a means, if not a completely reliable one, to prevent expansion of the fingers. Without friction, there would be no mechanism to rotate the shell assembly and the observed rotations could not have occurred.

(Id.)

In three of the four tests conducted on the Double Lock bolt by Dr. Sweet, using clear plastic cylinders as used by Frease, and using bonding material formulations intended to set up in one-half minute and one minute, the Double Lock bolt expansion shells rotated several revolutions before engaging the walls of the holes. On another test defendant's expansion shell seized immediately upon rotation. Dr. Sweet stated that while there was overlap in the numbers of rotations for the accused device and plaintiff's Instal bolt, the average rotations for the Instal bolts were greater than the average rotations for the Double Lock bolts, and the rotations of the Instal bolt were more consistent.

Plaintiff argues that the Frease and Sweet tests establish that defendant's shell assemblies do, in fact, rotate in the bore hole to mix the resin prior to anchoring themselves. Plaintiff, however, misconstrues these tests; the results of these tests are no different from the results of the DuPont tests considered by the Court in its May 1, 1989 Memorandum and Order, in that there was no consistent rotation of defendant's shell assembly. Moreover, Mr. Frease admitted in his deposition testimony that in a bore hole with resin "there could be more than one factor that effects whether or not the shell rotates at a -- close to the same rpm as the bolt or at a far less degree or not even at all .... There -- there's some variables in it." (Exhibit B to Frease Affidavit, p. 159). Mr. Frease admitted that even the plastic bag which contains the resin could cause resistance to be applied (id. at 160). Although plaintiff argues that any rotation by defendant's device in not unpredictable, it offers no evidence of predictability or control.

Plaintiff merely presents evidence that defendant's bolt assembly sometimes rotates as a unit to effectively but only partially mix the resin compound. This evidence, however, is insufficient to withstand a motion for summary judgment.

In testing the Double Lock bolt and comparing those test results with the claim language, neither Frease nor Sweet considered the vital specifications or prosecution histories of plaintiff's patents. Such examination is necessary to gain an understanding of what the inventor actually invented and intended to encompass by the claims at issue.

In this case, the Court has construed the claims of both patents 292 and 885 to require a reliable means or method of maintaining the expansion shell in an unexpanded condition or maintaining the camming plug fixed relative to the expandable shell, to assure predictable rotation of the shell for a specified amount of time required to mix the resin. This reliable means or method, the Court has found, requires the intentional incorporation of a tangible, displaceable stop means. A reliance on mere friction

which, if it even exists, is, as the tests indicate, uncontrollable, unreliable and subject to a range of variables; this in not what was contemplated by the patentee in the claims of patents 292 and 885.

In the Court's view, there is insufficient evidence in the record to create a genuine issue of material fact that defendant's bolt has a tangible, displaceable stop means or any means or method which assures the predictable rotation of the shell for a specified amount of time. Plaintiff has failed to produce evidence that the alleged equivalent stop means in defendant's bolt, friction between component parts, is able to maintain the expansion shell in an unexpanded condition or maintain the camming plug fixed relative to the expansion shell, to assure predictable rotation of the shell for a specified amount of time.

Moreover, the doctrine of equivalents will not extend to an accused infringing device which is in the public domain, that is, which is found in the prior art. Loctite Corp. v Ultraseal Ltd., 781 F.2d at 870; See also, Wilson Sporting Goods Co. v. David Geoffrey & Assoc., 904 F.2d 677, 683 (Fed. Cir. 1990), reh'g denied (July 5, 1990). Although the question of infringement is one of fact, the issue of whether as asserted range of equivalents would cover what is already in the public domain is a question of law. Loctite Corp. v. Ultraseal Ltd., 781 F.2d at 870.

Defendant's device presents no patentable difference above the prior art. The component parts of the Double Lock bolt, the adjacent surfaces of which plaintiff claims create the frictional forces which cause rotation of the shell until they are overcome to expand the shell, were fully disclosed and dedicated to the public in the prior art. Specifically, a camming plug, bolt threads, expansion shall, and jam nut.

In order to receive patent approval, the applicant must have presented something different than is taught by the prior art. If the claims of plaintiff's patents are not construed to necessitate the employment of tangible element intentionally incorporated to

assure that the expansion shell is maintained unexpanded or that the camming plug remains in fixed relation to the shell during mixture of the resin, plaintiff's patents would not have been allowed because they too would encompass prior art. Nothing new would have been taught by plaintiff's claims; the addition of the stop means was crucial to patentability.

Plaintiff's patents 292 and 885, although not pioneer patents, have improved upon the prior art by giving traditional mine roof bolts predictability and reliability of installation. This in achieved through the intentional incorporation of a tangible, displaceable device which assures that upon initial rotation of the bolt the resin is thoroughly mixed by the expansion shell which is maintained in an unexpanded condition or maintained in fixed relation with the camming plug throughout the predetermined mixing period. Through the displacement of that tangible, displaceable device at a predetermined point in the process, the camming plug is freed to permit expansion of the fingers of the shell to complete the anchoring process. As the Court has heretofore determined, defendant's Double Lock bolt does not infringe upon the claims in plaintiff's patents either literally or pursuant to the doctrine of equivalents.

VII. CONCLUSION

For the reasons stated, defendant's motions for summary judgment concerning patents 292 and 865 are GRANTED.

IT IS SO ORDERED.

/s/ John D. Holschuh
JOHN D. HOLSCHUH, JUDGE
UNITED STATES DISTRICT COURT

APPENDIX C
Federal Circuit Denial of Rehearing Petition
Dated January 22, 1993

ORDER

A combined petition for rehearing and suggestion for rehearing in banc having,been filed by the APPELLANT, and the petition for rehearing having been referred to the panel that heard the appeal, and thereafter the suggestion for rehearing in banc having been referred to the circuit judges who are in regular active service,

UPON CONSIDERATION THEREOF, it is

ORDERED that the petition for rehearing be, and the same hereby is, DENIED, and it is further

ORDERED that the suggestion for rehearing in banc be, and the same hereby is, DECLINED.

The mandate of the court will issue on January 29, 1993.

FOR THE COURT,
FRANCIS X. GINDHART,CLERK

Dated: January 22, 1993

By: /s/ Diane M. Frye
Diane M. Frye
Chief Deputy Clerk

cc: PAUL E. KRIEGER
JOSEPH W. BERENATO III
RICHARD A. FRYE

JENNMAR CORP V PATTIN MFG CO, 92-1250
(DCT - 2-84-878)

****
*
* Note: Pursuant to Fed. Cir. R. 47.8, this order is not *
* citable as precedent. It is a public record. *
*
****

APPENDIX D
Relevant Constitutional and Statutory Provisions

Article 1, section 8, clause 8 of the Constitution provides:

> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;

35 U.S.C. § 100(b) provides:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. § 101 provides:

> § 101. Inventions patentable
>
> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U.S.C. § 112 provides in relevant part:

> § 112. Specification
>
> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts

described in the specification and equivalents thereof.

35 U.S.C. §§ 271(g) and 295 provide in relevant part:

> § 271(g). Infringement of patent
>
> Whoever without authority imports into the United States or sells or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, sale, or use of the product occurs during the term of such process patent.

> § 295. Presumption: Product made by patented process
>
> In actions alleging infringement of a process patent based on the importation, sale, or use of a product which is made from a process patented in the United States, if the court finds--(1) that a substantial likelihood exists that the product was made by the patented process, and (2) that the plaintiff has made a reasonable effort to determine the process actually used in the production of the product and was unable so to determine, the product shall be presumed to have been so made, and the burden of establishing that the product was not made by the process shall be on the party asserting that it was not so made.

APPENDIX E
805 Method Claim 1 and 930 Apparatus Claim 15

United States Patent No. 4,419,805, Claim 1:

1. A method of anchoring a bolt in a bore hole comprising the steps of:

threadedly engaging a camming plug to the end of the bolt for axial movement thereon,

positioning an expandable shell having a plurality of longitudinally extending fingers in surrounding relation with the camming plug on the bolt,

preventing axial movement of the camming plug on the bolt by a stop means associated with the bolt upon rotation of the bolt in a preselected rotational direction,

preventing relative rotation between the bolt and the camming plug upon application of a predetermined torque by rotation of said bolt in the same preselected rotational direction so that the camming plug and the bolt rotate as a single unit and preventing said camming plug from rotating relative to said bolt and expanding said expandable shell,

displacing the stop means by the bolt as the bolt continues to rotate in said preselected rotational direction when a torque in excess of said predetermined torque is applied to the bolt; and

thereafter moving the camming plug on the bolt by rotation of said bolt in the same predetermined direction upon displacement of the stop means to expand the fingers of said expandable shell to anchor said expandable shell and said bolt connected thereto in the bore hole and applying a tension

to said bolt.

United States Patent No. 4,413,930, Claim 15:

15. A roof bolt assembly comprising,

an elongated bolt having a threaded portion with an end portion extending from said threaded portion,

a camming plug having an internally threaded bore and a stop means therein, said camming plug threadedly secured to said bolt threaded portion with said end portion abutting said stop means,

an expansion shell positioned around said camming plug and having a plurality of fingers, said fingers arranged to expand outwardly to anchor said bolt in a bore hole,

said bolt with said camming plug and expansion shell positioned thereon arranged to be positioned in a bolt hole with a cartridge of bonding material so that upon continuous rotation of said bolt in a single direction, said expansion shell fractures said cartridge and mixes said bonding material, and

said bolt arranged during the mixing of said bonding material and continued rotation in the same direction to displace said stop means in said camming plug after the viscosity of the bonding material has increased to a pre-selected torque on said expansion shell and move said camming plug downwardly on said bolt to expand said fingers of said expansion shell and anchor said bolt in a bolt hole.

APPENDIX F
292 Apparatus Claim 1

United States Patent No. 4,518,292, Claim 1:

1. A bolt assembly for securing a bolt in a bore hole having a bonding material therein comprising,

bonding material adapted to be positioned in an unmixed condition in a bore hole,

a bolt having a threaded end portion,

a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt upon rotation of said bolt in a preselected direction,

an expandable shell having a plurality of longitudinally extending fingers,

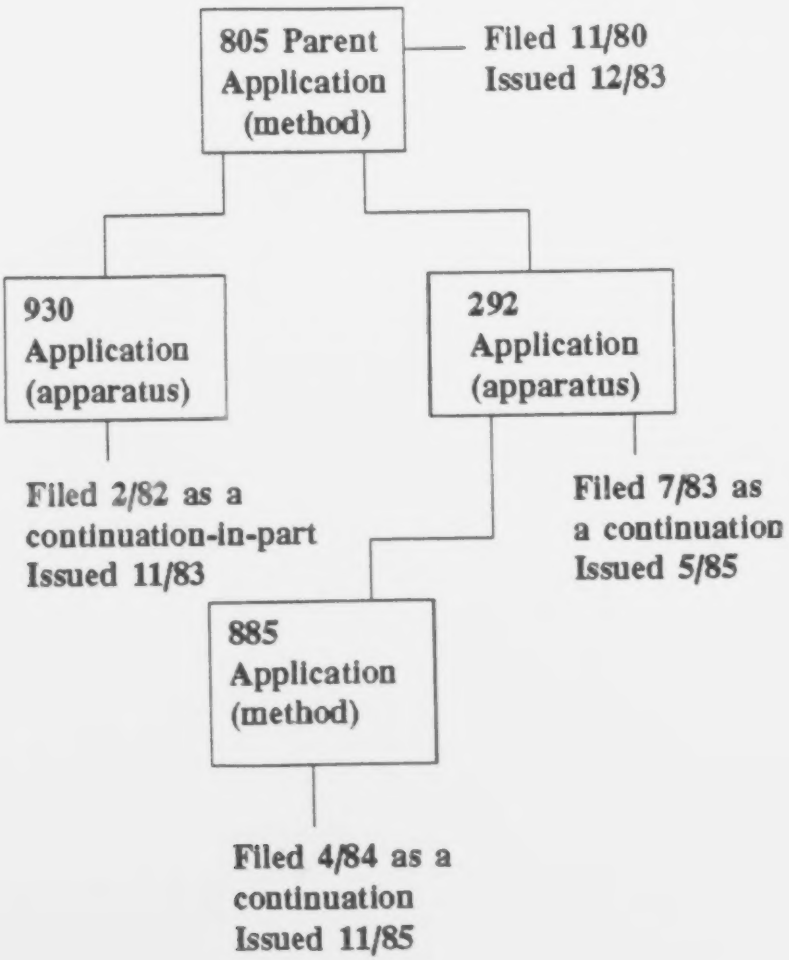
said fingers each having an inner surface and an outer surface, a portion of said inner surface abutting a portion of said camming plug outer surface and a portion of said finger outer surface adapted to engage the wall of said bore hole,

said expandable shell fingers arranged to expand outwardly to engage said outer surface of said fingers to the wall of said bore hole by longitudinal movement of said camming plug relative to said bolt threaded end portion and said expandable shell,

means for mixing at least a portion of said bonding material in said bore hole upon rotation of said bolt in said preselected direction in said bore hole while maintaining said expansion fingers in an unexpanded condition, and

means for moving said camming plug axially on said bolt threaded end portion and relative to said expandable shell fingers upon rotation of said bolt in said same preselected direction to expand said fingers and anchor said bolt in said bore hole.

APPENDIX G
Chart of Filing History for Jennmar Patents



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92-1683

No.

In The

Supreme Court of the United States

October Term, 1992

JENNMAR CORPORATION,
Petitioner,
v.
PATTIN MANUFACTURING COMPANY,
and
BIRMINGHAM BOLT COMPANY,
Respondents.

SUPPLEMENTAL APPENDIX TO PETITION FOR WRIT OF CERTIORARI U.S. PATENT NO. 4,516,885

Benjamin R. Civiletti*
George F. Pappas
Venable, Baetjer, Howard
& Civiletti
1201 New York Ave., N.W.
Suite 1200
Washington, D.C. 20005
(202) 962-4800

*Counsel of Record**
For Petitioner

Of Counsel:

Paul E. Krieger
Eugene R. Montalvo
Pravel, Hewitt, Kimball
& Krieger
1177 West Loop South
Tenth Floor
Houston, Texas 77027
(713) 850-0909

Steven Kreiss
1401 New York Ave., N.W.
Suite 740
Washington, D.C. 20005
(202) 347-2400

Date: April 22, 1993

EDITOR'S NOTE

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United States Patent [19]

Calandra, Jr.

[11] Patent Number: 4,516,885

[45] Date of Patent: * May 14, 1985

[54] METHOD AND APPARATUS FOR COMBINING RESIN BONDING AND MECHANICAL ANCHORING OF A BOLT IN A ROCK FORMATION

[75] Inventor: Frank Calandra, Jr., Johnstown, Pa.

[73] Assignee: Jennmar Corporation, Pittsburgh, Pa.

[*] Notice: The portion of the term of this patent subsequent to Dec. 13, 2000 has been disclaimed.

[21] Appl. No.: 602,204

[22] Filed: Apr. 19, 1984

Related U.S. Application Data

[60] Continuation of Ser. No. 497,113, Jul. 5, 1983, which is a division of Ser. No. 209,134, Nov. 21, 1980, Pat. No. 4,419,805.

[51] Int. Cl.³ B23P 25/00; F16B 13/06

[52] U.S. Cl. 405/261; 411/39; 411/55; 411/57; 411/60

[58] Field of Search ..... 405/259-261; 411/15, 19, 39-43, 55, 57, 60, 82, 29/458, 469.5, 522 R, 526 R

[56] **References Cited**

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3,877,235	4/1975	Hill	405/261
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4,051,683	10/1977	Koval	405/261
4,122,681	10/1978	Vass et al.	405/261
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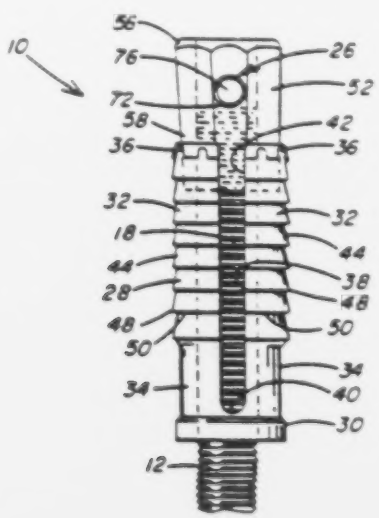
Primary Examiner—Thomas J. Holko
Assistant Examiner—Neill Wilson
Attorney, Agent, or Firm—Stanley J. Price, Jr.; John M. Adams

[57] **ABSTRACT**

A mechanical anchor including an expansion shell and a camming plug positioned in the shell is threaded onto the end of a mine roof bolt. A roof support plate is carried on the opposite end of the bolt. The mechanical anchor is inserted in a bore hole drilled in a rock formation with one or more resin cartridges advanced by upward movement of the bolt to the end of the bore hole. The cartridge is ruptured by upward thrust and rotation of the bolt to release the resin components for mixing. A stop device extending through the plug abuts the end of the bolt to prevent axial movement of the plug on the bolt when the bolt is rotated in a preselected direction to mix the resin components before the shell is expanded. Rotation of the bolt continues without expansion of the shell for a period of time to permit formation of a curable resin mixture. As the resin mixture begins to harden rotation of the shell and the plug is resisted until the stop device is displaced permitting relative rotation between the plug and the bolt. The plug nonrotatably moves down the bolt upon continued rotation of the bolt in the same preselected direction to expand the shell into engagement with the wall of the bore hole before the resin mixture cures. The cured resin bonds the bolt and expanded shell to the rock formation to resist slippage of the expanded shell and maintain the bolt in tension.

9 Claims, 11 Drawing Figures



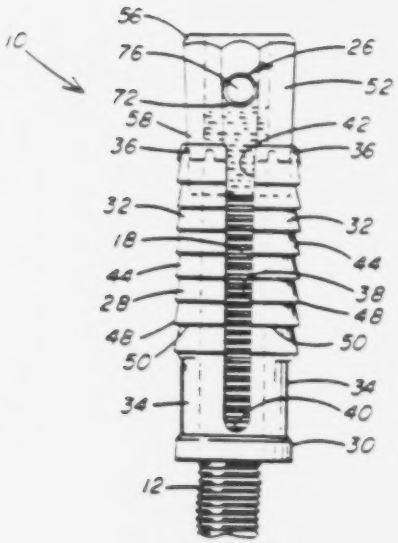


FIG. 1

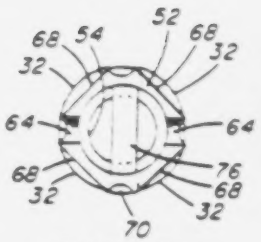


FIG. 2

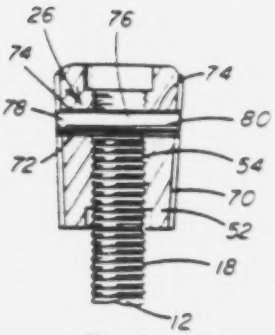
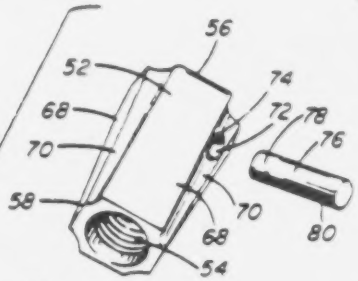


FIG. 4



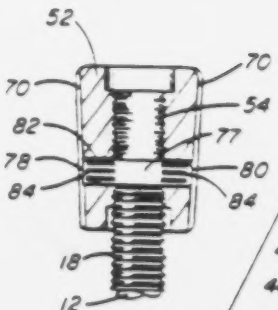


FIG. 5

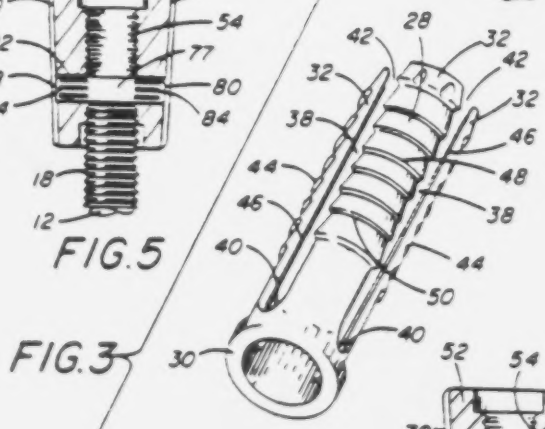
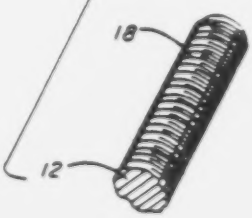


FIG. 3



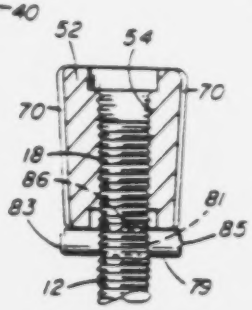


FIG. 7

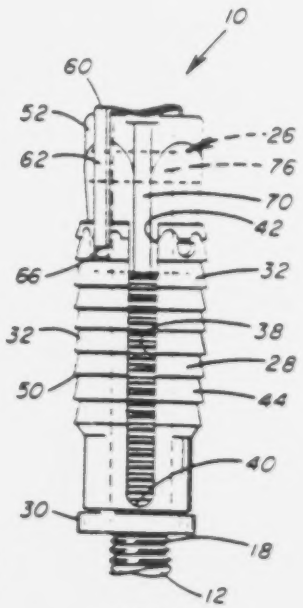


FIG. 6

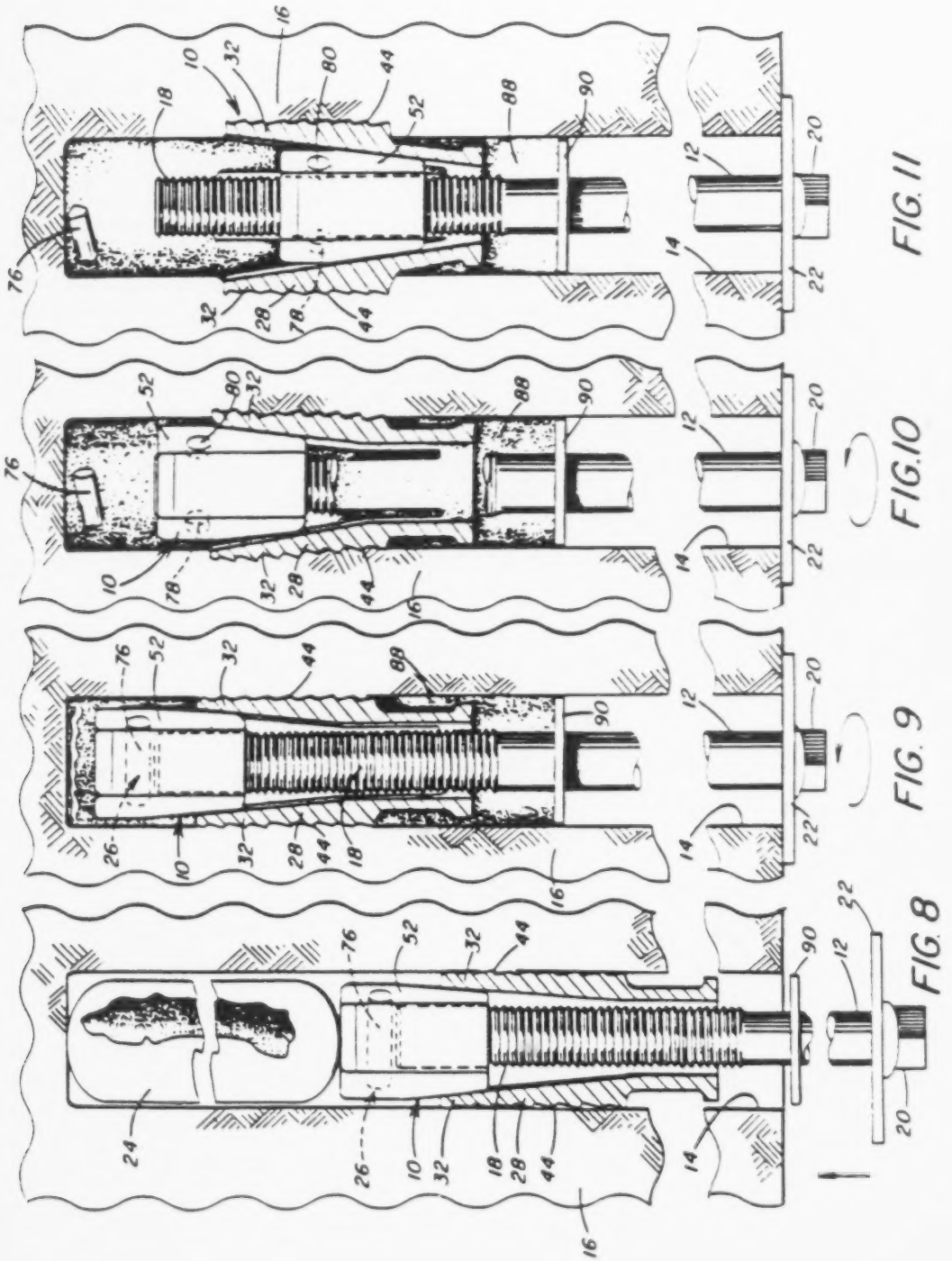


FIG. 11

FIG. 10

FIG. 9

FIG. 8

METHOD AND APPARATUS FOR COMBINING RESIN BONDING AND MECHANICAL ANCHORING OF A BOLT IN A ROCK FORMATION

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of copending prior application Ser. No. 497,113, filed July 5, 1983, entitled "Method And Apparatus For Combining Resin Bonding And Mechanical Anchoring Of A Bolt In A Rock Formation", which is, in turn a division of Ser. No. 209,134 filed Nov. 21, 1980, now U.S. Pat. No. 4,419,805, entitled "Method And Apparatus For Combining Resin Bonding And Mechanical Anchoring Of A Bolt In A Rock Formation".

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method and apparatus for combining resin bonding and mechanical anchoring of a bolt in a rock formation and more particularly to an expansion shell assembly adapted for use with bonding material where mixing of the bonding material components and expansion of the shell take place upon continuous rotation of the bolt in one rotational direction.

2. Description of the Prior Art

It is well known in the art of mine roof support to tension bolts anchored in bore holes drilled in the mine roof to reinforce the unsupported rock formation above the roof. Conventionally a hole is drilled through the roof into the rock formation. The end of the bolt in the rock formation is anchored by either engagement of an expansion shell on the end of the bolt with the rock formation or adhesively bonding the bolt by a thermosetting resin to the rock formation surrounding the bore hole. The resin also penetrates into the surrounding rock formation to adhesively unite the rock strata and to firmly hold the bolt in position in the bore hole. The resin mixture fills the annulus between the bore hole wall and the rod along a substantial length of the rod.

U.S. Pat. Nos. 3,324,662 and 3,394,527 disclose adhesively bonding a rod positioned in a hole drilled in a rock formation by a thermosetting polyester resin composition having thixotropic properties. It is well known that a bolt which is adhesively bonded in a bore hole can not be tensioned; on the other hand, a bolt mechanically anchored in a mine roof is capable of being tensioned but the contact of the roof bolt with the rock formation is confined to engagement of the expanded shell with the bore hole wall. Also, it is well known that deterioration of the rock formation surrounding the expanded shell reduces the contact area between the shell and the rock formation. Consequently the expanded shell slips and the tension on the bolt decreases, thereby reducing the roof support. Slippage of a tensioned mechanical roof bolt occurs most commonly in rock formations, such as shale, sandstone, mudstone, and the like.

In an attempt to resolve the disadvantages of anchoring by resin bonding or anchoring by expansion shells various types of mine roof support systems have been developed that combine mechanical anchoring and resin anchoring. The two systems have been combined by threading a bolt into a separate member such as a nut or coupling which is attached to a "rebar" anchored in the bore hole by a resin. A bolt with a plate held against the surface of the mine roof surrounding the bore hole is threaded into the separate member. Tightening the bolt places the bolt under tension. U.S. Pat. No. 3,702,060 discloses an expansion shell assembly that includes a resin container which is fixed to the end of an expander positioned within an expansion shell. The container is ruptured after the shell begins to expand. Rotation of the bolt mixes the resin components, and the resin mixture surrounds the shell to embed the shell in the cured resin to bond the shell to the rock strata. When the resin is fully cured, a nut on the end of the bolt opposite a roof plate on the bolt is rotated to bring the roof plate to its fully seated position against the mine roof to fully tension the bolt.

Combining bolt tensioning and resin bonding of a mine roof bolt bolt in the bore hole is disclosed in U.S. Pat. Nos. 3,877,235 and 4,051,683. The devices disclosed in these patents utilize an internally threaded member such as a nut or coupling which is connected at one end to a "rebar" anchored within the bore hole by the mixed and cured resin. A bolt is then connected to the other end of the nut or coupling and includes a bearing or roof plate advanced into abutting relation with the mine roof. A stop means provided in the coupling limits axial advancement of the bolt into the coupling to prevent relative rotation of the coupling and the bolt as the assembly is rotated to break the resin cartridge and mix the resin components. When the resin cures the "rebar" above the coupling is adhesively bonded to the rock formation. Thereafter rotation of the bolt in the coupling fractures the stop means to permit the bolt to move upwardly in the bore hole so that sufficient torque is applied to the bolt to tension the bolt.

Similar devices which utilize a rod anchored within the drill hole by resin bonding and connected to a bolt by a coupling with a stop device to restrain relative rotation between the members of the assembly until the resin hardens so that the bolt can be tensioned are disclosed in U.S. Pat. Nos. 4,122,681 and 4,192,631. These devices rely upon the bonding of the elongated rod to the rock formation by the resin mixture. They do not utilize a mechanical anchor.

U.S. Pat. Nos. 4,160,614 and 4,160,614 disclose a mechanical anchor in combination with resin bonding of the bolt and the rock formation. Rotation of the bolt with the mechanical anchor attached to the end thereof in a first direction effects mixing of the resin components of a ruptured cartridge. An anti-rotation device prevents relative rotation between the camming plug and the bolt so that the plug is not threaded off the end of the bolt during mixing of the resin components. With this arrangement the resin components are thoroughly mixed before the shell is expanded. After a period of time sufficient for mixing the resin and before the resin hardens direction of rotation of the bolt is reversed to disengage the anti-rotation device. The camming plug is then free to advance downwardly on the bolt and expand the shell into gripping engagement with the wall of the bore hole.

The point anchor resin roof bolt support system utilizes the concept of anchoring a reinforcing rod in a mine roof by resin bonding and tensioning the bolt. The rod is anchored at its upper end in the bore hole by resin. A nut is positioned on the threaded end of the rod that emerges from the bolt hole and abuts a roof plate positioned in contact with the mine roof. The end of the

rod at the nut is rotated to effect mixing of the resin. Rotation is terminated for a period of 30 to 60 seconds while the resin mixture cures. After the resin is set, then the bolt is rotated at a preselected torque to tension the bolt.

While it has been suggested by the prior art systems to anchor a roof bolt in a bore hole by combination resin bonding and bolt tensioning where mechanical anchors have been used it has not been possible to mix the resin and set the anchor by continuous rotation of the bolt in one direction. With the known systems the bolt must be rotated in a first direction to mix the resin while preventing expansion of the shell. When the mixed resin has begun to cure, then the direction of rotation of the bolt is reversed to expand the shell and set the anchor. Consequently careful attention must be given to rotating the bolt in the proper direction to mix the resin before the shell is set and not expand the shell before the resin is mixed. Furthermore when the bolt is rotated in the direction to effect mixing of the resin, necessary means must be provided to prevent threading the expander plug off the end of the bolt.

Therefore there is need in the system of combining resin bonding and mechanical anchoring of a bolt in a rock formation to provide a roof bolt anchor assembly that permits continuous rotation of a roof bolt in a single rotational direction to carry out both the operations of mixing the resin and expanding the shell.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided an expansion shell assembly for anchoring a bolt in a bore hole that includes a camming plug threadedly engaged to the end of the bolt for axial movement thereon. An expandable shell has a plurality of longitudinally extending fingers spaced from one another. The fingers each have an inner surface and an outer surface. A portion of the inner surface abuts the camming plug and the outer surface is adapted to engage the wall of the bore hole. Stop means associated with the camming plug prevents axial movement of the camming plug on the bolt upon rotation of the bolt in a preselected direction. The stop means is arranged to be displaced by the bolt upon continued rotation of the bolt in the preselected direction when a torque in access of a predetermined torque is applied to the bolt. The camming plug is then movable upon displacement of the stop means to expand the fingers to anchor the bolt in the bore hole.

Prior to insertion of the expansion shell assembly and the bolt in the bore hole a suitable bonding material, such as an adhesive resin material, packaged in a breakable cartridge, is inserted in the bore hole. The cartridge is advanced to the blind end of the bore hole by upward extension of the bolt with the expandable shell assembly attached to the bolt. Further upward advancement of the bolt fractures the cartridge, and thereafter the bolt together with the expansion shell assembly are rotated in a preselected direction to begin mixing the components of the adhesive material that were separated within the cartridge. Rotation of the bolt agitates the components to interact and form a curable adhesive mixture.

The stop means in one embodiment includes a shearable pin extending through a bore of the camming plug. End portions of the pin are retained in aligned bores of the camming plug. The pin passes transversely through the bore of the plug that receives the threaded end of the bolt. The end of the bolt abuts the pin to prevent initial downward axial movement of the plug on the bolt during rotation of the bolt to effect mixing of the adhesive components.

With the camming plug being restrained from downward movement on the bolt there is no relative rotation between the camming plug and the bolt. Thus the bolt, camming plug, and shell rotate as a single unit to effect mixing of the adhesive components in the bore hole. The curable mixture flows downwardly into contact with the shell and camming plug and fills the voids between the shell and the wall of the bore hole. The presence of the shear pin prevents downward movement of the camming plug on the bolt for the period of time required to complete mixing of the resin components. For a quick setting-type of adhesive material, expansion of the shell is delayed for about 20 to 30 seconds to permit complete mixing of the adhesive components before the shell is expanded.

As the adhesive mixture begins to harden around the shell and the camming plug, the mixture exerts a force upon the shell and camming plug resisting rotation of the shell and plug. When the torque applied to the bolt exceeds a predetermined torque the anti-rotation forces exerted by the curing adhesive material exceed the material strength of the pin and the pin fractures. The plug is then free to advance downwardly on the bolt upon continued rotation of the bolt in the same direction for mixing to expand the fingers of the shell outwardly to grip the bore hole wall.

Expansion of the shell occurs after a preselected time period of continued rotation of the bolt in one rotational direction. Thus the bolt is rotated in a single direction to effect both mixing of the adhesive material and expansion of the bolt. This arrangement eliminates the need for reversing the direction of rotation of the bolt to expand the shell after the adhesive material is mixed.

For an adhesive material of the quick setting resin-type, the mixed resin begins to harden within 20 seconds after rupture of the cartridge. The stop means in the embodiment of a shearable pin is constructed of a preselected material and has a preselected cross sectional area to control the material strength of the pin. Thus the pin is operable to fracture when the mixing stage is complete and before the resin mixture hardens. This assures that the shell will expand before the resin cures and after the resin is completely mixed. For a selected resin system the pin is designed to fracture or shear in the bore of the camming plug when the torque applied to the bolt exceeds a predetermined torque. Preferably, the predetermined torque required to shear the pin is not reached until after, for example, the bolt is rotated for 20 to 30 seconds, i.e., the period of time required for mixing the resin components.

The stop means in one embodiment includes a pin fabricated of aluminum and having a preselected diameter. In another embodiment the stop means includes a steel pin having a length and diameter differing from that of the aluminum pin because of the difference in material strength of aluminum and steel. Further the location of the pin relative to the plug is selective, i.e it can be retained in a selected axial position in the plug and abutting the end of the bolt or it can be retained in the bolt only and abutting the bottom of the plug. In each case by selecting the material composition and size of the pin, as well as, the position of the pin, the fracturing or shearing of the pin is controlable to meet the specifications of the resin system utilized. Thus a stop means is provided to permit mixing of the resin system

for the period of time required for the selected resin system used before the shell is expanded upon continuous rotation of the bolt in one direction.

Further in accordance with the present invention there is provided a method of anchoring a bolt in a bore hole that includes the steps of threadedly engaging a camming plug to the end of the bolt for axial movement thereon. An expandable shell having a plurality of longitudinally extending fingers is positioned in surrounding relation with the camming plug on the bolt. Axial movement of the camming plug on the bolt is prevented by a stop means associated with the bolt upon rotation of the bolt in a preselected rotational direction. The stop means is displaced by the bolt as the bolt continues to rotate in said preselected rotational direction when a torque in excess of a predetermined torque is applied to the bolt. Thereafter the camming plug is moved on the bolt upon displacement of the stop means to expand the fingers to anchor the bolt in the bore hole.

Accordingly, the principal object of the present invention is to provide a method and apparatus for combining resin bonding and mechanical anchoring of a mine roof bolt in a rock formation by an expansion shell assembly provided with stop means that restrains expansion of the shell as the bolt is rotated in a preselected direction and then when a torque in excess of a predetermined torque is applied to the bolt the stop means is displaced to permit expansion of the shell.

Another object of the present invention is to provide a mechanical anchor for a mine roof bolt that is also adhesively bonded within a bore hole where the bolt is continuously rotated in a preselected direction to permit the sequential operations of mixing the resin material and thereafter expanding the shell after the resin is mixed but before it is cured to engage the wall of the bore hole.

A further object of the present invention is to provide a stop device associated with an expandable shell assembly that is operable to restrain the expansion of the shell for a period of time required to permit mixing of resin components in a bore hole where expansion of the shell is delayed until a preselected torque is applied to the bolt and after the resin is mixed but before the resin is cured.

These and other objects of the present invention will be more completely disclosed and described in the following specification, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary enlarged view in side elevation of an expansion shell assembly positioned on the threaded end of an elongated bolt, illustrating a stop device carried by a camming plug and engaging the end of the bolt for restraining movement of the plug on the bolt.

FIG. 2 is a top plan view of the expansion shell assembly shown in FIG. 1, illustrating the stop device in the form of a shearable pin extending through the bolt and having end portions retained in the camming plug.

FIG. 3 is a fragmentary exploded view of the expansion shell assembly of the present invention, illustrating the shearable pin which is retained in a bore of the camming plug and arranged to abut the end of the bolt.

FIG. 4 is a fragmentary sectional view in side elevation of the camming plug positioned on the bolt with the shell removed, illustrating the shearable pin extending through the camming plug and abutting the end of the bolt.

FIG. 5 is a view similar to FIG. 4, illustrating the pin in a lower position in the camming plug and provided with parallel grooves on the opposite ends of the pin to control shearing of the pin.

FIG. 6 is a view similar to FIG. 1, illustrating the stop device used with a bail-type expansion shell assembly.

FIG. 7 is a view similar to FIGS. 4 and 5 illustrating the shearable pin extending through the bolt only and positioned in abutting relation with the lower end of the camming plug.

FIG. 8 is a side elevation partially in section of the first step in the method of installing the roof bolt in the bore hole, illustrating a resin cartridge in position at the end of the bore hole for rupture by the expansion shell assembly of the present invention.

FIG. 9 is a view similar to FIG. 8, illustrating mixing of the components of the ruptured cartridge by rotation of the bolt with the stop device restraining downward movement of the plug during mixing.

FIG. 10 is a view similar to FIGS. 8 and 9, illustrating a further step of continuing rotation of the bolt in the same direction to fracture the stop device after the mixing step to permit the plug to advance downwardly on the bolt and expand the shell. FIG. 11 is a view further illustrating the method of the present invention where the plug is advanced downward on the bolt to fully expand the shell fingers into engagement with the wall bore hole with the cured and hardened resin surrounding and embedding the expanded shell.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and particularly to FIGS. 1-3 there is illustrated an expansion shell assembly generally designated by the numeral 10 for securing a bolt 12 in a bore hole 14 drilled in a rock formation 16 (illustrated in FIGS. 8-11) to support the rock formation 16 that overlies an underground excavation, a mine passageway, or the like. The bolt 12 has a threaded end portion 18 which is positioned in the upper blind end of the bore hole 14. The bore hole 14 is drilled to a preselected depth into the rock formation 16 as determined by the load bearing properties to be provided by the expansion shell assembly 10 and the bolt 12.

The bolt 12 has an enlarged opposite end portion 20 as seen in FIGS. 8-11 which extends from the open end of the bore hole 14. A roof of bearing plate 22 is retained by the bolt enlarged end portion 20 on the end of the bolt 12. Further in accordance with the present invention a breakable cartridge 24 containing a conventional two component bonding material, such as disclosed in U.S. Pat. Nos. 3,324,662 and 3,394,527 is initially inserted in the bore hole 14 and advanced to the blind end of the bore hole 14, as shown in FIG. 8, by upward advancement of the bolt 12 in the bore hole 14. Once the cartridge 24 is ruptured and the components thereof are mixed by rotation of the bolt 12 in a preselected direction, a stop device generally designated by the numeral 26 restrains expansion of the shell assembly 10 until the roof plate 22 is in abutting relation with the surface of the rock formation 16 and the adhesive components are mixed.

The bolt is continuously rotated in the same preselected direction for a period of time sufficient to complete mixing of the components of the bonding material. The stop device 26 prevents expansion of the shell as-

sembly 10 during the mixing stage. The bolt continues to rotate in the same initial direction. When the torque applied to the bolt exceeds a predetermined torque, as determined by the time for mixing the bonding material, the stop device 26 fractures. The expansion shell assembly 10 is then free to expand into gripping engagement with the wall of the bore hole 14. The continuous rotation of the bolt in the same initial direction completes the setting of the assembly 10. Thus the bolt is both mechanically anchored and adhesively bonded in the bore hole to prevent slippage of the expanded assembly 10 so that the bolt 12 remains tensioned to support the rock formation.

Now referring in greater detail to the structure of the expansion shell assembly 10 there is provided a shell member 28 conventional in design and including a solid ring end portion 30. The shell member 28 is expandable and has a plurality of longitudinally extending fingers 32 that extend axially from the ring end portion 30. Each of the fingers 32 has a lower end portion 34 connected to the ring end portion 30 and an upper end portion 36. Longitudinally slots 38 (only one of which is shown in FIG. 1) divide the fingers 32 from one another. Each of the slots 38 has a closed end portion 40 adjacent the ring end portion 30 and an open end portion 42 adjacent the upper end portion 36 of the respective finger 32.

Each finger 32 includes an outer gripping surface 44 and an inner smooth surface 46. The outer surface 44 includes a gripping portion 48 that extends from the finger upper end portion 36 to a position spaced from the finger lower end portion 34. The gripping portion 48 of each finger 32 includes a series of spaced parallel, tapered horizontal grooves 50. The grooves 50 form a series of downwardly extending serrations that are operable upon expansion of the shell member 28 to engage the wall of the bore hole 14 as the fingers 32 bend outwardly.

The gripping portion 38 of each finger 32 is urged into contact with the wall of the bore hole 14, as seen in FIGS. 10 and 11, by a camming plug or wedge generally designated by the numeral 52. The camming plug 52 includes a threaded axial bore 54 threadedly engaged to the bolt threaded end portion 18. The camming plug 52 has a tapered configuration with an enlarged upper end portion 56 and a reduced lower end portion 58. A portion of the inner surface 46 of each finger 32 abuts a tapered planar surface 68 of the camming plug 52.

As illustrated in FIG. 1, the camming plug 52 and the shell member 28 are maintained in assembled relation on the bolt threaded end portion 18 prior to anchoring the assembly in the bore hole 14 drilled in the mine roof. Also as well known in the art and illustrated in FIG. 6, the camming plug 52 and the shell member 28 are connected by a yieldable strap or bail 60. The bail 60 is conventional and extends across the top of the camming plug 52. The bail 60 includes leg portions 62 that extend downwardly on opposite sides of the shell member 28. The leg portions 62 are positioned in a pair of opposed slots 64. The leg portions 62 terminate in in-turned end portions 66 that extend into the slots 64 and into engagement with the inner surface 46 of the shell member 28. With this arrangement the bail 60 is engaged to the shell member 28 to maintain the camming plug 52 assembled within the shell member 28.

As illustrated in FIG. 3, the camming plug 52 includes a plurality of tapered planar surfaces 68 divided from one another by longitudinally extending grooves 70. As described above, the inner surface 46 of each finger 32 abuts a respective tapered planar surface 68. In one embodiment of the present invention the stop device 26 is positioned in a bore 72 that extends through the camming plug 52 transversely to the threaded bore 54 of the camming plug 52. As seen in FIGS. 3 and 4, the transverse bore 72 includes opposite end portions 74 that extend through the plug 52 and emerge through a pair of oppositely aligned grooves 70 of the plug 52.

Further as illustrated in FIGS. 1–4, the stop device 26 includes a shearable pin 76 fabricated of a preselected yieldable material and having a preselected size and in the case of a circular pin, a preselected diameter. The pin 76 is retained in the transverse bore 72 and includes respective end portions 78 and 80. The pin end portions 78 and 80 are retained in the bore end portions 74 of the plug 52 as illustrated in the embodiments of the stop device 26 in FIGS. 1–6. The intermediate body portion of the pin 76 extends transversely through the plug longitudinal bore 54.

The shearable pin 76 is selectively positioned to extend through the plug threaded bore 54 at a location to obstruct or prevent axial movement of the bolt threaded end portion 18 beyond a preselected depth into the camming plug bore 54. Thus upon initial assembly of the expansion shell assembly 10, the bolt threaded end portion 18 is advanced into the camming plug 52 until the bolt end portion 18 abuts the shearable pin 76 and can advance no further into the camming plug threaded bore 54.

The location of the transverse bore 72 through the camming plug 52 for positioning the shearable pin 76 is selective along the longitudinal length of the camming plug 52. To this end, as illustrated in FIG. 4, the shearable pin 76 is positioned in the camming plug transverse bore 72 at a location adjacent the plug upper end portion 56. In the embodiment of the present invention illustrated in FIG. 5, the shearable pin 76 is positioned in a plug transverse bore 82 located adjacent the plug lower end portion 58.

With the embodiment illustrated in FIG. 5 the length of the bolt threaded end portion 18 that extends into the camming plug bore 54 is less than that length when the shearable pin 76 is retained in the camming plug 52 adjacent the plug upper end portion 56. In the position of the shearable pin 76 in the camming plug 52, as illustrated in FIG. 5, the camming plug 52 is threaded on the bolt 12 to engage only several of the threads on the bolt end portion 18. The intermediate body portion of the shearable pin 76 prevents the bolt 12 from passing any further into the camming plug threaded bore 54.

The material from which the shearable pin 76 is fabricated is selective, as for example, in one embodiment the pin 76 can be fabricated of ¼ inch diameter steel, while, in another embodiment it can be fabricated of 5/16 diameter aluminum. The type of material comprising the pin 76, as well as, the dimensions and cross sectional area of the pin 76 are selective to control the shearing or fracturing of the pin depending upon the type of bonding material utilized and the period of time required for mixing of the material components. Further to ensure shearing or fracturing of the stop device 26 before the curable mixture hardens a stop device, such as a steel pin 77 illustrated in FIG. 5, is provided with deformations, such as longitudinally extending, parallel spaced grooves or recesses 84 positioned on the opposite end portions 78 and 80 of the pin 77.

The material composition and structural design of the stop device 26, such as the pins 76 and 77 illustrated in

FIGS. 4 and 5, are selected in accordance with the curing time of the particular type of bonding material utilized. For example with a quick setting type of resin system which begins to harden within 20 to 30 seconds following rupture of the cartridge 24 and mixing of the components, the size and material composition of the stop device 26 are selected to permit fracture after 20 seconds of rotation of the bolt 12. Thus when the resin mixture begins to harden and apply a force upon the assembly 10 resisting rotation of the shell member 28 and plug 52, the stop device 26 fractures. Also fracture of the stop device 26 occurs when the torque applied to the bolt 12 exceeds a predetermined torque. When the stop device 26 is no longer capable of resisting the anti-rotational forces of the adhesive material applied to the rotating shell assembly 10, the stop device 26 fractures or shears. Relative rotation between the camming plug 52 and the bolt 12 is no longer prevented. The camming plug 52 is then free to move downwardly on the bolt 12 as the bolt 12 continues to rotate in the same preselected rotational direction.

The ability to control the shearing of the pin 76 provides a versatile expansion shell assembly 10 operable for use in combination with adhesive materials of varying curing characteristics, such as a quick setting-type resin curable within 20 seconds of mixing or the type of adhesive material requiring 2 to 3 minutes of mixing before hardening begins. By selecting the material composition and cross sectional area of the stop device 26 in the form of a shear pin, as well as, the location of the shear pin relative to the camming plug 52, expansion of the shell member 28 is prevented until after lapse of the time required to effect the necessary mixing of the adhesive components. Once the curable mixture is formed and begins to harden, the mixture exerts anti-rotational forces upon the camming plug 52 rotating with the bolt 18. When the shear pin is no longer capable of resisting these forces, the pin fractures freeing the bolt 18 to rotate relative to the camming plug 52. This action commences downward movement of the plug 52 and expansion of the shell 28. In addition, the entire operation is carried out by continuous rotation of the bolt 18 in the same direction. Preferably the shear pin fractures before the adhesive mixture completely solidifies or hardens so that the expandable fingers 32 are movable outwardly into gripping engagement with the wall of the bore hole 14.

A further embodiment of the shear device 26 is illustrated in FIG. 7. In this embodiment a shear pin 79 is retained solely in a bore 86 extending transversely through the threaded end portion 18 of the bolt 12 adjacent the extreme end thereof. The shear pin 79 includes an intermediate portion 81 retained in the transverse bore 86 and a pair of opposite end portion 83 and 85. The pin end portions 83 and 85 extend outwardly from the bore 86 and in the assembly 10 are positioned oppositely of a pair of slots 38 between adjacent shell fingers 32. The camming plug 52 is advanced downwardly on the bolt until the lower end portion 58 of the plug 52 abuts the pin end portions 83 and 85. The pin end portions 83 and 85 abutting the camming plug 52 prevent further downward movement of the camming plug 52 on the bolt 12.

As with the above described embodiments of the stop device 26 the shearable pin 79 resists relative rotation between the bolt 12 and the camming plug 52 until a torque in excess of a predetermined torque is applied to the end of the bolt. At this torque the resistance offered by the curable bonding mixture to rotation of the plug 52 results in fracturing of the pin 79. The pin 79 is designed so that it does not fracture until the mixing of the bonding materials is complete and the mixture begins to harden. The pin end portions 83 and 85 break off from the intermediate portion 81 and are free to move through the shell slots 38.

When the torque for breaking the pin 79 is reached, the mixing is complete. The pin 79 breaks permitting downward movement of the camming plug 52 to expand the shell member 28. Expansion of the shell member 28 is delayed until the bonding material is mixed but not after the mixture rigidifies in the bore hole 14.

It should also be understood that the stop device 26 includes any suitable device that restrains axial movement of the plug 52 on the bolt 12 beyond a preselected point on the threaded end portion 18 of the bolt 12, as for example, a breakable obstruction member suitably retained in the plug threaded bore 54. The breakable member is operable to restrain relative rotation between the bolt 18 and the plug 52 until a preselected torque is applied to the bolt 18. Before the preselected torque is applied, the bonding material is mixed. When a torque in excess of the preselected torque is applied, the breakable member is displaced in the plug bore 54 to the extent permitting relative rotation between the bolt 18 and the plug 52 permitting downward movement of the plug 52 on the bolt. This results in expansion of the shell member 28 and anchoring of the assembly 10 in the bore hole 14.

The stop device 26 in another embodiment can include an obstruction which is not required to break or shear before expansion of the shell member 28 begins. This type of stop device 26 can include a flexible member, such as wire or the like, having end portions secured to the camming plug 52 and extending through the plug bore 54 obstructing the path of the rotating bolt 18. The wire abutting the end of the bolt 12 prevents downward movement of the plug 52 on the bolt 18. Movement of the plug 52 is restained until the anti-rotational forces of the bonding mixture applied to the plug 52 result in yielding or bending of the wire permitting downward movement of the plug 52 on the bolt 12 upon continued rotation of the bolt 12. The application of the torque which results in bending of the wire corresponds to the formation of a curable bonding mixture and the initiation of expansion of the shell member 28.

Now referring to FIGS. 8-11, there is illustrated the method of anchoring the apparatus 10 and the bolt 12 in the bore hole 14 of the rock formation 16. Initially, as illustrated in FIG. 8, the resin cartridge 24 is inserted in the hole 14 drilled in the mine roof or rock formation 16 by upward advancement by the bolt 12 with the apparatus 10 attached to the threaded end portion 18 of the bolt 12. The cartridge 24 is pushed to substantially the blind end of the bore hole 14. With the cartridge 24 inserted in the upper part of the bore hole 14, as illustrated in FIG. 8, the bolt 12 is thrust upwardly to rupture of the cartridge 24.

Thereafter, the entire assembly 10 is rotated in a preselected direction as indicated by the arrow in FIG. 9 by applying a torque to the bolt enlarged end portion 20. The stop device 26 in the form of the shear pin 76 illustrated in FIGS. 8-11, fabricated of a preselected material and of a preselected size prevents relative rotation between the camming plug 52 and the bolt 12 during the initial rotation of the bolt 12 to rupture the cartridge and mix the resin components. In this manner the

camming pluge 52 is restrained from moving downwardly on the bolt 12 by the bolt 12 abutting the shear pin 76 during the initial rotation of the bolt 12.

Rotation of the bolt 12 effects mixing of the resin components which are released from the cartridge 24 when the cartridge 24 is ruptured. Preferably the resin components include a thermoplastic resin and a catalyst. As the bolt 12 is rotated the resin and the catalyst are mixed to form a curable resin mixture 88. The resin mixture 88 by virtue of its thixotropic characteristics is retained within the bore hole 14. To effectively retain the volume of the mixture 88 in surrounding relation with the assembly 10 a suitable device, such as a washer 90, is retained on the bolt 12 adjacent the bolt threaded end portion 18. The washer 90 has a diameter sufficient to permit the washer to move freely in the bore hole 14 with the bolt 12 into position. In one embodiment, the washer 90 is fabricated of metal and may be either welded or press fit on the bolt 12 spaced a preselected distance below the bolt threaded portion 18. In another embodiment the washer 90 is fabricated of an elastomeric material. The elastomeric washer 90 is retained in gripping engagement on the bolt 12 below the threaded end portion 18.

The resin mixture 88 polymerizes at room temperature, i.e. a temperature in the range between about 40° to 90° F. The bolt 12 is rotated continuously in the direction indicated by the arrow in FIG. 9 to effect mixing of the resin. The shear pin 76 abutting the bolt end portion 18 prevents relative rotation between the camming plug 52 and the bolt 12. This prevents the camming plug 52 from moving downwardly on the bolt 12 until the mixing of the resin components is complete The period of time for mixing a quick setting-type resin is generally between about 20 to 30 seconds. During the mixing stage as seen in FIG. 9 the bolt 12 is held in position within the bolt hole 14 with the roof plate 22 abutting the rock formation 16 around the open end of the bolt hole 14.

The shear pin 76 by restraining downward movement of the camming plug 52 on the bolt 12 ensures complete mixing of the resin components before the shell 28 is expanded. However, due to the shear characteristics of the pin 76 designed for the resin system utilized, the shell 28 expands before the resin mixture 88 completely hardens around the shell member 28. From the time the cartridge 24 is ruptured, the bolt 12 is continuously rotated in one direction only, i.e. either clockwise or counterclockwise, to mix the resin components, as well as, expand the shell member 28. As the bolt 12 rotates the curable resin mixture 88 flows into the fissures and faults of the rock formation 16 surrounding the bore hole 14. In this well known manner, the rock strata are adhesively united to further reinforce the rock formation.

After the mixing stage, resin mixture 88 begins to cure or harden in the bore hole 14. As the resin mixture 88 begins to harden it exerts forces on the rotating shell member 28 and the camming plug 52 resisting their rotation. At a predetermined torque applied to the bolt 12, which is reached after a elapse of time to complete the mixing, the material strength of the shear pin 76 is exceeded by the anti-rotational forces exerted by the resin mixture 88 and the pin 76 fractures or shears. Consequently, the intermediate portion of the pin 76 in the plug bore 54 is broken off from the pin end portions 78 and 80 which are retained in the plug, as seen in FIG 10. This permits the pin 76 to be displaced in the camming plug bore 54 so that the plug 52 is free to move downwardly on the bolt threaded end portion 18

Referring to FIG. 10, downward movement of the camming plug 52 on the bolt 12 upon rotation of the bolt 12 in the same direction for forming the resin mixture 88, expands the shell member 28. The fingers 32 are bent outwardly about the shell ring end portion 30 to move the outer gripping surfaces 34 into gripping engagement with the wall of the bore hole 14. The rotation of the bolt 12 is continuous in the direction indicated by the arrows in FIGS. 9 and 10 through the resin mixing and shell expanding stages. Rotation of the bolt 12 continues until a preselected torque is applied to the bolt 12. When the preselected torque is applied, the shell member 28 is fully expanded and the gripping portions 48 of the fingers 32 are embedded in the rock formation to securely anchor the bolt 12 in the bore hole 14.

When the shell member 28 is expanded the resin mixture 88 is cured. By anchoring the bolt 12 in the bore hole 14 by the expansion shell member 28, the bolt 12 is tensioned. The addition of the cured resin in surrounding relation with the bolt 12 and the expanded shell member 28 prevents slippage of the shell member 28 in the bore hole 14. Tension on the bolt is thus maintained and is not reduced by slippage of the expanded shell member 28 in the bore hole.

By the provision of the stop device 26, the expansion shell assembly 10 is operable as a mixing tool to admix the components of the resin cartridge 24 to form the curable mixture 88 before the shell member 28 is expanded. The stop device 26 prevents downward movement of the camming plug 52 on the bolt 12 during the period in which the resin components are mixed. Also by the provision of the stop device 26, the bolt 12 is continuously rotated in the same preselected direction to effect both mixing of the resin components and expansion of the shell member 28. Thus it is not necessary with the present invention to rotate the bolt 12 in a first direction to effect mixing of the resin components and then followed by reversal of the direction of rotation of the bolt 12 to effect expansion of the shell member 28.

The provision of the stop device 26 associated with the camming plug 52 substantially improves the efficiency and ease of installation of a roof bolt that is both mechanically anchored and resin bonded within a bolt bore hole. It should also be understood even though the direction of rotation for both mixing the resin components and expanding the shell member 28 is illustrated in a counterclockwise direction in FIGS. 10 and 11, the direction of rotation can be clockwise as well depending upon whether the bolt end portion 18 is left-hand threaded or right-hand threaded.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiments. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A method of anchoring a bolt in a bore hole comprising the steps of,

positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation

with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,

positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end of said threaded portion of said bolt in a manner that said camming plug is movable longitudinally on said bolt threaded portion,

inserting a bonding material into a bolt hole,

inserting said bolt with said camming plug threadedly engaged thereto into a bore hole,

rotating said bore in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and

thereafter rotating said bolt in said same preselected direction and moving said camming plug on said bolt to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

2. A method of anchoring a bolt in a bore hole comprising the steps of,

positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,

positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end portion of said threaded portion of said bolt,

inserting a bonding material in an unmixed condition into a bore hole,

inserting said bolt with said camming plug threadedly engaged thereto into said bore hole,

rotating said bolt in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and

thereafter rotating said bolt in said same preselected direction and moving said camming plug relative to said bolt on said bolt threaded end portion to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

3. A method of anchoring a bolt in a bore hole as set forth in claim 2 which includes,

rotating said bolt in said same preselected direction and moving said camming plug relative to said expansion shell to move portions of said fingers into engagement with the wall of said bore hole, and

thereafter rotating said bolt in said same preselected direction and moving said bolt upwardly in said camming plug to apply a tension to said bolt in said bore hole.

4. A method of anchoring a bolt in a bore hole as set forth in claim 2 which includes,

permitting at least a portion of said bonding material to flow downwardly in said bore hole around at least a portion of said bolt, camming plug and expansion shell, and

rigidifying said bonding material around a portion of said bolt, said camming plug and said expansion shell to prevent rotation of said bolt in a direction opposite to said preselected direction and thereby maintain tension on said bolt.

5. A method of anchoring a bolt in a bore hole comprising the steps of,

positioning a camming plug having an internally threaded bore and an outer surface into the upper portion of an expansion shell with a portion of said camming plug outer surface in abutting relation with a portion of the inner surface of a plurality of fingers extending upwardly from a lower ring portion of said expansion shell,

positioning said expansion shell on the threaded end portion of said bolt and threadedly engaging said camming plug to the end of said threaded portion of said bolt to form a bolt assembly,

inserting a cartridge of unmixed bonding material into said bore hole,

thereafter inserting said bolt with said camming plug threadedly engaged thereto into said bore hole,

breaking said cartridge of unmixed bonding material with said bolt assembly,

rotating said bolt in a preselected direction while maintaining said camming plug in fixed relation with said expansion shell to thereby mix at least a portion of said bonding material, and

thereafter rotating said bolt in said same preselected direction and moving said camming plug downwardly on said bolt in a direction away from the end of said bolt threaded portion to expand the fingers of said expansion shell and apply a tension to said bolt in said bore hole.

6. A method of anchoring a bolt in a bore hole as set forth in claim 5 which includes,

permitting at least a portion of said bonding material to flow downwardly in said bore hole around at least a portion of said bolt, camming plug and expansion shell.

7. A method of anchoring a bolt in a bore hole as set forth in claim 1 which includes,

positioning said camming plug outer surface in abutting relation with the end portions of said expansion shell fingers with said camming plug nonrotatably engaged to said fingers.

8. A method of anchoring a bolt in a bore hole as set forth in claim 1 which includes,

connecting said expansion shell to said bolt solely by means of said camming plug.

9. A method of anchoring a bolt in a bore hole as set forth in claim 1 which includes,

positioning said expansion shell ring portion around said bolt with an annular space therebetween so that said expansion shell is connected to said bolt by means of said camming plug.

* * * * *

Supreme Court, U.S.
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No. 92-1683

IN THE

Supreme Court of the United States

OCTOBER TERM, 1992

JENNMAR CORPORATION,

Petitioner,

v.

PATTIN MANUFACTURING COMPANY,

and

BIRMINGHAM BOLT COMPANY,

Respondents.

On Petition For Writ Of Certiorari To The United States Court Of Appeals For The Federal Circuit

BRIEF IN OPPOSITION

Of Counsel:

JOSEPH W. BERENATO, III
MYERS, LINIAK & BERENATO
6550 Rock Spring Drive
Bethesda, Maryland 20817
(301) 365-8000

RICHARD A. FRYE
Counsel of Record
BLYTHE M. BETHEL
SCHWARTZ, KELM, WARREN & RUBENSTEIN
41 South High Street
Columbus, Ohio 43215
(614) 222-3025

Date: May 25, 1993

PRESS OF BYRON S. ADAMS, WASHINGTON, D.C. (202) 347-8203

STATEMENT PURSUANT TO RULE 29.1

All parties to the proceeding below are set forth in the caption to the case. Respondent Birmingham Bolt Company has been merged into its parent corporation Birmingham Steel Corporation, a public corporation. Respondent Pattin Manufacturing Company was until 1987 an unincorporated division of The Eastern Company, a public corporation. In 1987, the assets of Pattin were sold to Birmingham Bolt.

TABLE OF CONTENTS

	Page
STATEMENT PURSUANT TO RULE 29.1	i
TABLE OF CONTENTS	ii
TABLE OF CASES, STATUTES AND OTHER AUTHORITIES	iii
OPINIONS BELOW	1
STATEMENT OF THE CASE	1
A. PROCEDURAL HISTORY	1
B. STATEMENT OF FACTS	2
SUMMARY OF THE ARGUMENT	5
ARGUMENT	5
A. THE DISTRICT COURT FOLLOWED PROPER METHODOLOGY FOR INTERPRETING PATENT CLAIMS.	5
B. A MINE ROOF BOLT IS A MANUFACTURE AND PETITIONER HAD THE BURDEN OF SHOWING HOW IT PERFORMED THE STEPS OF THE METHOD	6
C. THE '885 PATENT IS A NARROW ONE IN A CROWDED ART.	7
D. THE "NEW" RESIN IS A NEW ISSUE	9
E. NO NATIONAL INTERESTS ARE AT STAKE	9
F. THERE IS NO CONFLICT BETWEEN THE PANELS OF THE FEDERAL CIRCUIT	10
CONCLUSION	10

TABLE OF CASES, STATUTES AND OTHER AUTHORITIES

CASES	Page
Aro Manufacturing Co., Inc. v. Convertible Top Replacement Co., Inc., 365 U.S. 336 (1961)	5
Atlantic Thermoplastics Co., Inc. v. Faytex Corp., 970 F.2d 834, *reh'q denied*, 974 F.2d 1279 (Fed. Cir. 1992)	10
Celotex Corp. v. Catrett, 477 U.S. 316 (1986)	8
Graham v. John Deere Co., 383 U.S. 1 (1966)	6
Halliburton Oil Well Cementing Co. v. Walker, 329 U.S. 1 (1946)	9
Royer v. Coupe, 146 U.S. 524 (1892)	7
SRI Intern. v. Matsushita Elec. Corp. of Am., 775 F.2d 1107 (Fed. Cir. 1985)	7
Tilghman v. Proctor, 102 U.S. 707 (1880)	8
Universal Oil Products Co. v. Globe Oil & Refining Co., 322 U.S. 471 (1944)	8
Westinghouse v. Boyden Power Brake Co., 170 U.S. 537 (1898)	7

STATUTES AND RULES

35 U.S.C. § 101	6

OPINIONS BELOW

The *per curiam* Opinion of the Federal Circuit Court of Appeals is noted in 985 F.2d 583 (1992).

The district court issued two separate opinions in this case in which summary judgment against Petitioner was granted. Four different patents allegedly infringed by Respondents were addressed. The Petition seeks to bring before this Court only a portion of the second 1991 Opinion. (20 U.S.P.Q. 2d (B.N.A.) 1721; App. A3) The 1989 Opinion addressed similar issues, and analyzed Pattin's "Double Lock" bolt which was the accused mine bolt system. The 1989 Opinion was referenced at certain points in the trial court's 1991 Opinion, and is referenced in the Petition at page 8. That earlier Opinion was reported at 12 U.S.P.Q. 2d (B.N.A.) 1321 (S.D. Ohio 1989).

STATEMENT OF THE CASE

A. PROCEDURAL HISTORY.

Petitioner Jennmar Corporation sued Respondent Pattin Manufacturing Co. in May 1984, alleging that the Double Lock® bolt, but not all mine roof bolts, manufactured and sold by Pattin infringed two patents issued to Jennmar President Frank Calandra. An accountant by training, Calandra thereafter received two additional, related patents for mine roof bolts which were added to the lawsuit in July 1985.

Intensive pretrial discovery followed. Hundreds of interrogatories and requests for admission were answered by Pattin, thousands of pages of documents were produced, and dozens of witnesses were deposed. Among the witnesses were three employees of DuPont, the manufacturer of a mine resin cartridge

commonly used with mine roof bolts, including the Double Lock bolt.

Relying primarily upon an expert Affidavit from the managing director of Pattin, and upon deposition testimony and test reports of the DuPont witnesses, Pattin moved for summary judgment on the first two Calandra patents [numbers '930 and '805] in February 1987. Following briefing and oral argument, Chief Judge John D. Holschuh granted Pattin's motion in a 35 page opinion which found neither patent infringed. 12 U.S.P.Q. 2d (B.N.A.) 1321. (May 1, 1989)

Summary judgment was then sought on the two remaining Calandra patents [numbers '885 and '292]. Chief Judge Holschuh granted summary judgment of noninfringement on the last two patents. (App. A3)

Following resolution of a counterclaim on an unrelated mine roof bolt patent, now expired, appeal to the Federal Circuit Court of Appeals followed. That court affirmed in a one-line *per curiam* Opinion released a week after argument. Jennmar's rehearing request was denied, as was its suggestion for *in banc* review. (App. A49) This Petition followed.

B. STATEMENT OF FACTS.

Here, as in the district court and the Federal Circuit, Petitioner disregards decades of prior art in the field of mine roof bolting. The district court, however, fully appreciated the vast prior art background to the Calandra patents when it found:

> Mine roof bolts have been known in the art of mine roof support to anchor in bore holes drilled in a mine roof to reinforce the unsupported rock above the roof. *It is un-*

> *disputed that mine roof bolts combining mechanical and resin anchoring are included in the prior art.* It is also undisputed that the prior art teaches that resin will be mixed, in part, by the mere placement of the bolt into the bore hole. Prior art includes a bolt having a threaded end portion; a camming plug having an internally threaded bore and an outer surface, said camming plug threadedly engaged to the threads adjacent the end of said bolt threaded end portion, said camming plug positioned to move axially on said bolt upon rotation of said bolt in a preselected direction; an expandable shell having a plurality of longitudinally extending fingers each having an inner surface and an outer surface, a portion of said inner surface abutting a portion of the camming plug outer surface and a portion of the finger outer surface adapted to engage the wall of a bore hole; expandable shell fingers arranged to expand outwardly to engage the outer surface of the fingers to the wall of a bore hole by longitudinal movement of the camming plug relative to the bolt threaded end portion and the expandable end portion and the expandable shell; and a means for moving the camming plug axially on the bolt threaded end portion. (App. 15-16) (emphasis added.)

When all four Calandra patents were issued in the early 1980's, this was a crowded art. Even the Calandra '885 patent acknowledged that its "shell member [is] conventional in design." (Suppl. App., col. 7, lines 15-16.)

Beginning at least as early as 1958, those of ordinary skill in this art knew that conventional mine roof bolts could be installed with resin cartridges. Further advances followed through the 1960's and 1970's, as professional literature appeared and United States patents issued on bolts and bolting systems using resin. Chemical manufacturers, such as DuPont, worked independently to perfect both the resin and the plastic cartridges used to contain resin as it was inserted with the metal bolts into holes drilled into the mine roof. These developments were summarized by expert witness George Vass in an affidavit submitted in 1987:

> Basic, conventional mine bolt designs have remained substantially unchanged since the 1950's, with the exception of things like David Hill's invention in the mid-1970's. Apart from the fact changes in bolt designs are infrequent, I also know coal mining companies and coal miners generally are resistant to changing to new bolt designs once they have a bolt in which they have confidence for a particular mine.

(Ct. Appeals Jt. Appendix, p. A387.)

Prompted by Jennmar to perform tests, DuPont analyzed Pattin's Double Lock bolt. DuPont reached conclusions contrary to Jennmar's position, and its evidence confirmed that there was no "*reliable* means or method of maintaining the expansion shell in an unexpanded condition. . .to mix the resin" as '885 required. (App. A46; emp. original.)

SUMMARY OF THE ARGUMENT

The district court properly considered the distinctions between Petitioner's method claims and the accused Double Lock bolts, and correctly concluded that infringement was avoided because there was no structure which reliably assured rotation of the mechanical expansion shell with the bolt to mix resin. The Federal Circuit Court of Appeals implicitly adopted the findings and legal conclusions of the district court when a distinguished panel of that court summarily affirmed that opinion (App. A1).

The question presented seeks merely to apply an otherwise well-entrenched legal principle to facts specific to the case. Clarification of an otherwise clear line of legal authority need not occur. The disputed point, even if resolved in Petitioner's favor, will affect only the parties at bar.

ARGUMENT

A. THE DISTRICT COURT FOLLOWED PROPER METHODOLOGY FOR INTERPRETING PATENT CLAIMS.

Petitioner does not dispute that the district court set forth the proper methodology for interpreting the claims of the '885 patent. (App. 35-37) As noted by the district court (App. A14-15), "[t]he threshold requirement in claim construction is an examination of the claims at issue because it is the claim which measures the invention. *Aro Manufacturing Co., Inc. v. Convertible Top Replacement Co., Inc.*, 365 U.S. 336, 339 (1961)." Petitioner's only dispute is with the result achieved, and not the law applied to reach that result. Petitioner's argument, when stripped to its

essence, concerns the highly fact specific application of its patent claims to the Double Lock[1].

B. A MINE ROOF BOLT IS A MANUFACTURE AND PETITIONER HAD THE BURDEN OF SHOWING HOW IT PERFORMED THE STEPS OF THE METHOD.

Petitioner has accused a "manufacture", namely a mine roof bolt, of carrying out the various steps of its method claims. It cannot seriously be disputed that the Double Lock bolt is manufactured from a number of structural parts or elements which the district court recognized were old in the mine roof support art, and which had been assembled in that same manner since long prior to the filing date of Petitioner's patents. Of course, patents may be lawfully granted only on that which is new, useful, and unobvious; 35 U.S.C. § 101, *Graham v. John Deere Co.*, 383 U.S. 1, 12 (1966). Hence, the courts below necessarily focused upon the improvement disclosed and claimed in Petitioner's patent.

Petitioner does not dispute that means such as the shear pin, prominently referenced in its patent, will, if used, assure predictable rotation of the otherwise prior art expansion shell when mounted to the oth-

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[1] Almost one page of the Petition is devoted to describing the invention by reference to the drawing figures and specification describing its mine roof bolt (Petition, p. 3). Additional discussion is directed to the Double Lock bolt (Petition, pp. 4-5). Little, if any, discussion explains the claimed method invention, the only invention under consideration.

Respondents sell mine roof bolts, articles of manufacture, as are the patented bolts. Thus, while Petitioner directs this Court's attention to its "bolt" when explaining its invention, it criticizes the courts below for looking to that bolt when construing the claims covering its method of installation.

erwise prior art bolt, Petition, p. 3. A shear pin is the structural element which Petitioner, but not Respondents, utilized to cause its improved results to be achieved.

Petitioner's '885 method claims are directed to a series of steps or acts, all having the purpose of anchoring its bolt. The steps employ verbs to explain and set forth what is occurring during the anchoring process. Verbs are action words, and it was Petitioner's burden to explain to the courts below how the parts of the Double Lock bolt performed the claimed actions, *SRI Intern. v. Matsushita Elec. Corp. of America*, 775 F.2d 1107, 1123 (Fed. Cir. 1985). By the very nature of the charges made by Petitioner, the courts below were obligated to look to the Double Lock bolt when determining whether its structural components, either singularly or cooperatively, performed those actions.

Because the actions were not performed, there could be no infringement, *Royer v. Coupe*, 146 U.S. 524, 533 (1892).

C. THE '885 PATENT IS A NARROW ONE IN A CROWDED ART.

While Petitioner seeks to have its '885 claims construed as if they arise from a pioneer invention, *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 562 (1898), the field was quite crowded when the Calandra application was filed.[2] Petitioner does not dispute the district court's characterization of the field

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[2] The district court explicitly found that construing the claims as not requiring some tangible means like the shear pin would cause them to unlawfully encompass the prior art. (App. A47-48).

in its Opinion at App. 15-16. Under the law, the '885 claims must be construed with that prior art as a necessary background, *Tilghman v. Proctor*, 102 U.S. 707, 710 (1880).

This Court's opinion in *Universal Oil Products Co. v. Globe Oil & Refining Co.*, 322 U.S. 471 (1944), effectively lays to rest Petitioner's argument that a process patent in a crowded art may be construed to cover the use of substantially different apparatus. In *Universal Oil Products*, the Court considered a method invention in a "crowded art", *id.* at 484, and held:

> [w]hile varying the details of a process does not avoid infringement, Tilgham v. Proctor, 102 U.S. 707, 26 L. Ed. 279, *when the accused process does not substantially follow the mode taught in the patent, there is no infringement.* (Emphasis added).

Id. at 485.

The courts below construed Petitioner's claims as employing a mode using a shear pin or some other tangible, displaceable structure having the purpose of assuring predictable rotation of the shell with the bolt in order to mix the resin (App. A46-A47). The district court found that the Double Lock bolt not only lacked the structural elements which could permit that mode to be employed, but that Petitioner failed to produce any evidence that the alleged equivalent, friction between parts, would assure predictable rotation, *Celotex Corp. v. Catrett*, 477 U.S. 316, 322 (1986).[3] Of

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[3] "Where the questions presented by the contested claims of infringement. . .are purely factual, this Court ordinarily accepts

course, mere friction of parts on a conventional mine bolt was long known in this art, and was not invented by Calandra.

D. THE "NEW" RESIN IS A NEW ISSUE.

Petitioner vainly attempts to recast the friction theory (which the district court recognized came up late in this case as "a new theory of equivalence", App. A40), by only now arguing that infringement is made out because the Double Lock bolt "uses a new, less viscous resin and competes directly in the marketplace with Jennmar's patented bolt." (Petition, p. 5.) In its Brief to the Federal Circuit, Petitioner stated to the contrary that the Double Lock "uses the same type of resin cartridge". (Brief at 6) In view of Supreme Court Rule 15.1, the Petition should not be granted upon the mistaken belief that the issue presented could be decided.

Moreover, Petitioner's approach runs afoul of the recognized rule that competition in the marketplace is not to be restrained by unlawfully extending the patent monopoly, *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1, 12 (1946).

E. NO NATIONAL INTERESTS ARE AT STAKE.

It is readily apparent from the detailed analysis made by the district court and adopted by the court of appeals that the question Petitioner presents is highly fact specific and of interest largely, if not exclusively, to only the parties at bar. While Petitioner hypothesizes that matters of great national interest are at stake, Petition, p. 25 *et seq.*, nothing of the

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the concurrent conclusions of the district court and Circuit Court of Appeals". *Universal Oil Products, supra.* at 473.

sort is supported by the record. For example, Respondents each manufactured their version of the Double Lock bolt in the United States, so the Process Patent Amendment Act of 1988 (Petition, p. 26) is not applicable. Furthermore, considering that that Act was concerned with the extraterritorial making of an article subsequently imported into the United States, it is not apparent how the Act applies to a "method of anchoring a bolt in a bore hole". The claimed method is to use of the article, and not to its method of manufacture.

F. THERE IS NO CONFLICT BETWEEN THE PANELS OF THE FEDERAL CIRCUIT.

Petitioner also makes too much of the Federal Circuit Court of Appeals decision in an unrelated case, *Atlantic Thermoplastics Co., Inc. v. Faytex Corp.*, 970 F.2d 834, *reh'q denied*, 974 F.2d 1279 (1992) (Petition, pp. 19-20), because the decision there involved "product-by-process claims", *id* at 846-847. Those sorts of claims are not presented here.

Similarly, while Petitioner strains to suggest that as a matter of course panels of the Federal Circuit Court of Appeals are in conflict, no conflict is apparent on this record nor does one exist. As noted, Petitioner raised this point below and requested rehearing and *in banc* review, and yet both were summarily denied without dissent. (App. A49) The appeals court thought so little of this point that no opinion was deemed necessary. Certainly some member of the Federal Circuit Court of Appeals would have recognized this conflict had one existed.

CONCLUSION

For the reasons stated, the Petition should be denied.

Respectfully submitted,

RICHARD A. FRYE
Counsel of Record
BLYTHE M. BETHEL
SCHWARTZ, KELM, WARREN & RUBENSTEIN
41 South High Street
Columbus, Ohio 42315
(614) 222-3025

Of Counsel:

JOSEPH W. BERENATO, III
MYERS, LINIAK & BERENATO
6550 Rock Spring Drive, Ste. 240
Bethesda, Maryland 20817
(301) 365-8000